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Revision of the *Pseudohemihyalea'* species from Costa Rica (Erebidae Arctiinae Arctiini Phaegopterina) with description of new taxa, as well as redescription and delimitation of species previously described in the genus and present in the country

BERNARDO A. ESPINOZA-SANABRIA (1, *), MICHEL LAGUERRE (2), DANIEL H. JANZEN (3) & WINNIE HALLWACHS (4)

(1) Asociación de Conservación Guanacaste Bosque y Mar (ACGBM) / BioAlfa Project. - bespinoza@gdfcf.or
- Orcid: https://orcid.org/0009-0005-8391-2308 - ZooBank: https://zoobank.org/43471CD1-B68E-435D-B22D-17B0659E558E

(2) 31 Rue de la Haute-Lande, 33850 Léognan, France. - mlaguerre@wanadoo.fr
- Orcid: https://orcid.org/0000-0002-6524-7069 - ZooBank: https://zoobank.org/2146C3FF-355D-4649-AB4B-20BE73BDC602

(3) Department of Biology, University of Pennsylvania, Philadelphia, PA 19104, USA. - djanzen@sas.upenn.edu
- Orcid: https://orcid.org/0000-0002-7335-5107 - ZooBank: https://zoobank.org/4491369A-CFA6-4614-AC09-1137CCD06F9A

(4) Department of Biology, University of Pennsylvania, Philadelphia, PA 19104, USA. - whallwac@sas.upenn.edu
- Orcid: https://orcid.org/0000-0002-5166-809X - ZooBank: https://zoobank.org/C318F42F-7632-4B9C-B62A-67171F7BF583

* Corresponding author

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Abstract. – We revise the species of *Pseudohemihyalea* Rego Barros, 1956 recorded from Costa Rica. The study is based on research conducted for many years on the subfamily Arctiinae (Erebidae), and incorporates recent genomic information (DNA barcodes) in support of morphological investigations. We delimit twelve species of *Pseudohemihyalea* previously identified from Costa Rica, some of which were described by Hervé de Toulgoët in the 1980s and 1990s. We redescribe *P. ochracea*, *P. daraba* and *P. annario*, the last reestablished as a valid species after having been synonymized with *P. ochracea*. We also describe nine new species: *Pseudohemihyalea donharveyi* **sp. n.**, *Pseudohemihyalea anaisabelsanabriae* **sp. n.**, *Pseudohemihyalea johnbrowni* **sp. n.**, *Pseudohemihyalea toulgoëti* **sp. n.**, *Pseudohemihyalea rexhamiltoni* **sp. n.**, *Pseudohemihyalea bosullivani* **sp. n.**, *Pseudohemihyalea montywoodi* **sp. n.**, *Pseudohemihyalea eugeniephillipsae* **sp. n.**, *Pseudohemihyalea marcepsteini* **sp. n.**, which were hidden or misidentified within material of other species. Additionally, we synonymize *Pseudohemihyalea asignata* (Reich, 1938) with *Pseudohemihyalea annario* (Dyar, 1914) and restablish *Amastus fuscescens* (Rothschild, 1909) as a valid species of *Pseudohemihyalea*, resulting in a new combination. Finally, we include images of adults and male and female genitalia, DNA barcode data, and geographical distribution in Costa Rica for all species studied.

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Introduction

Pseudohemihyalea currently comprises 39 described species, three of which are recognized as subspecies (Vincent & Laguerre, 2014). The genus exhibits a wide geographical distribution in the Americas, from the southern part of the United States to South America. Its type species, *Phaegoptera rhoda* Druce 1894, was described from Guatemala. The genus was proposed by Alfredo Rei do Rego Barros (1956) in his revision of Brazilian *Hemihyalea*, building upon a previous study by Hampson (1901). Rego Barros' (1956) work, based on morphological features of the genitalia, demonstrated the need to reassign some of the species and subspecies previously considered members of *Hemihyalea*, to a different genus (i.e., *Pseudohemihyalea*).

Watson and Goodger (1986) considered *Pseudohemihyalea* a synonym of *Hemihyalea*. However, after a subsequent 1992 revision of *Hemihyalea*, and an in-depth study of Mexican and Central American *Pseudohemihyalea* species of 1994, Hervé de Toulgoët reestablished the genus. In addition to the above, with Toulgoët later revisions of species from other latitude of the continent, many of the described species were more clearly

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circumscribed, and others were described as new, including four species from Costa Rica.
Studies by Rego-Barros (1956), Watson & Goodger (1986), Toulgoët (1992), and Vincent & Laguerre (2014) together provide an excellent foundation upon which to evaluate new discoveries in *Pseudohemihyalea*. With sequences of the mitochondrial gene COI, previous species circumscriptions for many the Central America *Pseudohemihyalea* species are not as clear as initially suggested, with the taxonomic rank of some requiring further analyses. Hence, continued field work and additional sequencing are necessary to fully resolve relationships within the genus.

Materials and Methods

All the material examined for this work comes from the Museo Nacional de Costa Rica collections and from the ongoing inventory of the Lepidoptera of Área de Conservación de Guanacaste (ACG) through rearing wild-caught caterpillars and light-trapping adults (Janzen et al., 2009; Janzen & Hallwachs, 2016), as well as from the BioAlfa collecting field trips between 2019 and 2022 (these collections now part of MNCR-A collections). Additionally, information on adult photographs, genitalia images and DNA sequences of *Pseudohemihyalea* species from other countries, from ML and BV Collections, relevant to this work was available for this study as well as some images of type specimens and some type genitalia deposited at the MNHN and NHMUK.
Genitalia were dissected following the procedures described by Lafontaine (2004) and photographed in natural position, suspended in 95% alcohol. The preparations are currently stored in glycerin. Photographs of adults and genitalia were taken with a Nikon CoolPix 4500 using a super micro-lens and a Cannon EOS R6 Mark II with a Canon 100mm Macro Lens. Sequencing of the barcoding gene region of the COI gene was carried out at the Canadian Center for DNA barcoding in the Biodiversity Institute of Ontario at the University of Guelph, Ontario, Canada using standard protocol (Hebert et al., 2003). Successful barcode sequences were aligned and downloaded from BOLD, and a distance-tree analysis was performed using MEGA12 (Kumar et al., 2024) with the Neighbor-joining method and default parameters. Measurements of wing lengths were taken with a 6-inch stainless steel digital caliper with fractional & decimal display.

Repository abbreviations

MNCR-A	Museo Nacional de Costa Rica, San José, Costa Rica.
MNHN	Muséum National d'Histoire Naturelle, Paris, France.
NHMUK	Natural History Museum, London, England, United Kingdom.
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA.
MLC	Personal collection of Michel Laguerre, 33850 Léognan, France.
BVC	Personal collection of Benoît Vincent, 31130 Quint-Fonsegrives, France

Systematics

In the mid-1990's, a large number of adult specimens of *Pseudohemihyalea* (males and females) sorted to morpho-species in the former INBio collection (now MNCR-A) was sent to Hervé de Toulgoët at the MNHN in Paris, for identification. Following his revision of the genus, the material was returned to Costa Rica. It comprised, ten identified species, two of which were described as new, and one of which was transferred to a different genus closely related to *Pseudohemihyalea*.
Based on the identified samples augmented by more recently collected material, mainly from high elevations of the Cordillera de Talamanca, the Cordillera Volcánica Central, and Cordillera de Guanacaste, it has become increasingly clear that *Pseudohemihyalea* is considerably more diverse and species rich in Costa Rica than previously recognized. Associating conspecific males and females is extraordinarily challenging in this group, consequently some species are known only from a single sex.
Pseudohemihyalea ochracea (Rothschild, 1909), is particularly an interesting case that requires a more comprehensive analysis and discussion, as it's undoubtedly the most complex species described from Costa Rica, very difficult to characterize due to its high level of intraspecific variation present, which was verified by barcoding sequences of COI. Considering the above, and the fact that the species includes several synonymous, its taxonomic history need to be reviewed. Additionally, based on DNA sequences successfully obtained for *P. ochracea*, we could find two distinct lineages hidden within this taxon and so a revision of the synonymy was fundamental to clarified *P. ochracea* status, as well as the identity of the second unknown species and any potential changes for synonymy stablished.
Consequently, images of the female holotype specimen of *P. ochracea*, No. 3145 (Fig. 16a) and its corresponding genitalia, No. 3145 (Fig. 16b), (NHMUK), as well as images AS3505A (Fig. 16h) and AS3505B (Figs 16i) of a male dissected by Toulgoët from MNHN were examined. The image of the female holotype slide preparation lacks the corpus bursae, but Toulgoët illustrated complete male and female genitalia for that species in his 1994 *Pseudohemihyalea* revision, and so the species was preliminarily identified by morphology of adults and male and female genitalia structures.
It was also possible to access 'type' and 'not type' information for the following *P. ochracea* synonyms:

- *Pseudohemihyalea battyi* (Rothschild, 1909). Images of the syntype female specimen, No. 3146 (Fig. 16c) and its genitalia slide No. 3146 (Fig. 16d), (NMHUK).
- *Pseudohemihyalea annario* (Dyar, 1914). Images of the lectotype female specimen, No. 18906, genitalia slide No. AW589 (USNM). Species fully illustrated by Allan Watson in his 1973 Catalogue.
- *Pseudohemihyalea niger* (Seitz, 1925). Images of holotype male specimen, No. 3124 (Fig. 16e), and genitalia slide No. 3124 (Figs 16f, g), (NMHUK).
- *Pseudohemihyalea oligocycla* Seitz, 1925. Images of female genitalia slide of the specimen No. 3147 (NOT TYPE), and male genitalia slide (genitalia capsule and phallus respectively) of the specimen number 3120 (Figs j, k) (NOT TYPE), (NHMUK).

Given that *P. ochracea* is an extremely difficult species to identify in collections, DNA sequences of material (males and females) from different localities in Costa Rica were required to verify morphological variation. As a result, we obtained two different sequences associated with this taxon, corresponding to the BINs BOLD:ABZ6561 and BOLD:ACE8750. Surprisingly, the two BINs share the same pattern of adult morphological variation. At this point, the identity of the true *P. ochracea* as previously determined was doubtful, but comparison of male and female genitalia of prepared specimens from MNCR collections with those of the female holotype, the male dissected from MNHN and Toulgoët's published illustrations allowed us to confirm that the true *P. ochracea* was correctly identified and linked to the BIN BOLD:ABZ6561. Even though the holotype female genitalia preparation lacks the corpus bursae, the conspecific association for male and female *P. ochracea* was verified through DNA sequences, confirming that Toulgoët's identification was correct.
Related to the second BIN (BOLD:ACE8750), this sequence is 1.71% divergent from *P. ochracea* (BOLD:ABZ6561). Specimens (male and female) were dissected and the female genitalia perfectly match the female lectotype genitalia of *P. annario* in the shape of the corpus bursae, which is an elongated, thin, and moderately small structure

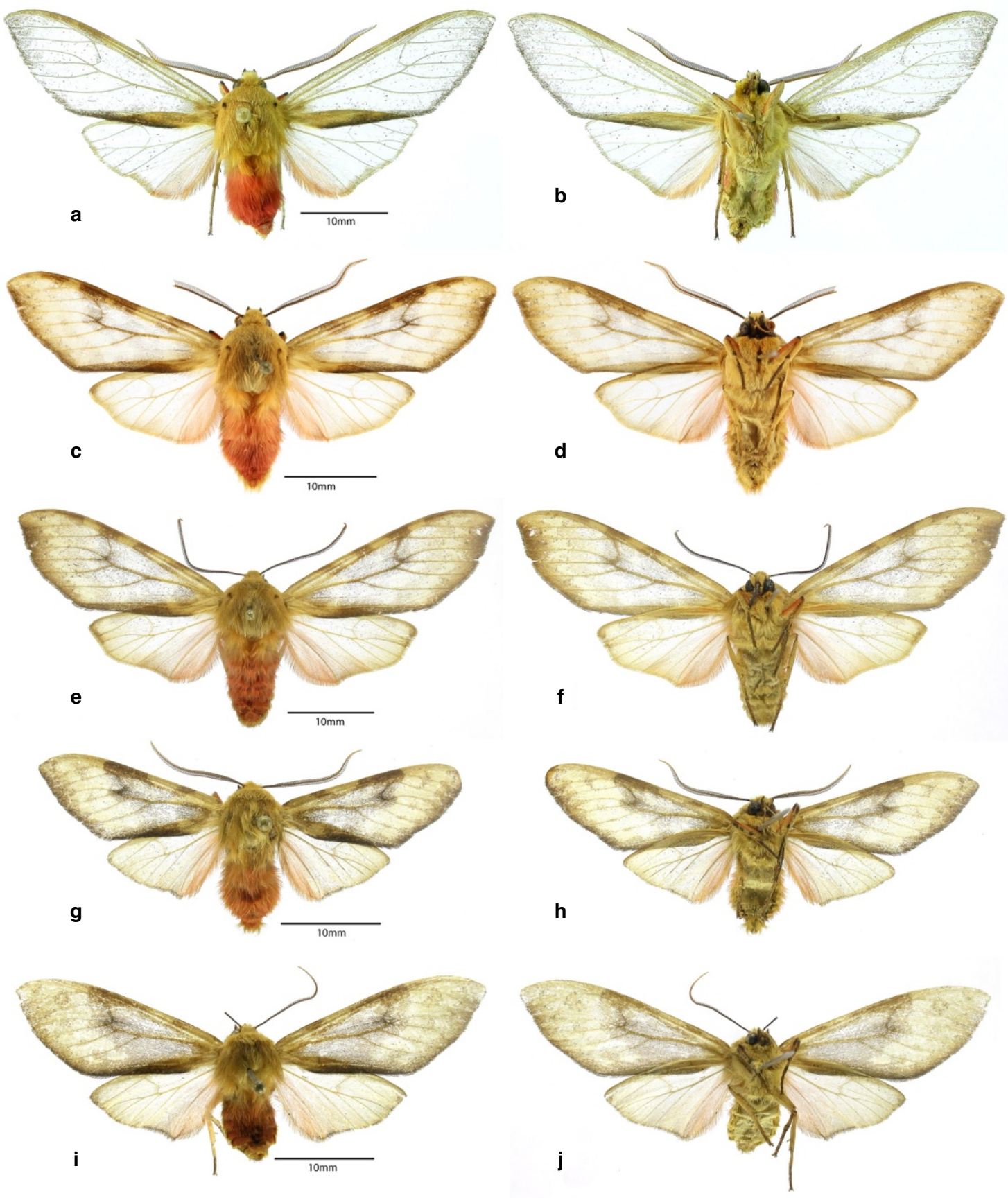

Figure 1. Adults of *Pseudohemihyalea*.

a, **b**. *P. daraba* (Druce, 1894), ♂, INB0004160707. **c**, **d**. *P. donharveyi* **sp**. **n**., ♂, INB0004184805 (H-T). **e**, **f**. *P. donharveyi* **sp**. **n**., ♀, 19-BAES-00121 (P-T). **g**, **h**. *P. anaisabelsanabriae* **sp**. **n**., ♂, 19-BAES-00062 (H-T). **i**, **j**. *P. anaisabelsanabriae* **sp**. **n**., ♀, 19-BAES-00597 (P-T).

that has nothing to do with that of *P. ochracea*, for which the corpus bursae is larger and more robust. Regarding the male genitalia, the structures are very similar to those of *P. ochracea*, with the main differences present in the basal portion of the uncus as well as in the basal portion of the valvae. In *P. ochracea* the basal half of the uncus is projected dorsally, with two lateral processes, deer horn-shaped (Figs 15a, c). These deer horn-shaped projections, "in natural position", do not arise exactly laterally, but anteriorly in *P. annario* (Figs 15b, d). The basal portion of the valvae in ventral view are wider and with a triangular inner projection in *P. annario* (Fig. 15d), while this structure is thinner and straight in *P. ochracea* (Fig. 15c). The anterior margin of tegumen also differs between these two taxa, which is less deep in *P. annario* (Fig. 15b) than in *P. ochracea* (Fig. 15a). The vesica also differ between *P. annario* and *P. ochracea*, as this structure is rectangular-shaped, with the distal lobe short and thick in *P. annario* (Fig. 15e), but oval, with an elongated and thinner distal lobe in *P. ochracea* (Fig. 15f). The above let us to confirm that *P. annario* is a valid species and so we have *Pseudohemihyalea annario* (Dyar, 1914), **stat**. **rev**.

Pseudohemihyalea battyi, listed as a synonym of *P. ochracea* by Watson and Goodger (1986), required revision too. The species was described from Palenka Island, Colombia and from an undisclosed number of female syntypes, one of them bearing the TYPE label (Vincent & Laguerre, 2014)**.** In the first instance, the type locality is confusing, considering that it was not possible to find any place in Colombia called Palenka Island. Then, the most probable explanation to the above is that "Palenka Island" is a misspelling, which in reality may refer to a place in Panama called Palenque Island, located in the province of Chiriquí, from where other species of *Pseudohemihyalea* were described by Rothschild as well. It should be noted that Panama was part of the Great Colombia prior to 1903.

In a subsequent 2003 publication, Hervé de Toulgoët made reference of *P. battyi*, illustrating a potential male for that species from Colombia, based on the adult habitus of three specimens he received from that country, with the connotation that the samples look pretty much the same as those of *P. ochracea* and *P. mansueta*, but with different shape of genitalia structures, so he suggested those samples might belong to *P. battyi* species. However, since he was not totally sure about this, he emphasizes that it was just a possibility and left the question open for future analysis to confirm or discard the conspecific association of those males with the female of *P. battyi*. Then, at this point with no additional information of *P. battyi* available, there is no way to answer either positively or negatively to Toulgoët's proposal, and the male of *P. battyi* remains still unknown.

Finally, after examining the female syntype specimen of *P. battyi*, No. 3161 (Fig. 16c) and comparing its female genitalia slide No. 3146 (Fig. 16d) with that of *P. annario*, lectotype, Arctiidae genitalia slide No. AW589, and the female illustrated in this work for *P. ochracea*, Fig. 14d, voucher 19-BAES-00207, it was possible to conclude that *P. battyi* presents visible differences in the shape of the lamella antevaginalis, which is a broader structure, with a less prominent bilobed tip than in *P. ochracea* and in *P. annario*. Also, and even though *P. battyi* has similar corpus bursae to that of *P. annario*, the latter has an elongated thin structure, while the corpus bursae is wider in the distal half in *P. battyi*. The female genitalia slide for the *P. ochracea* holotype, genitalia slide No. 3145 (Fig. 16b) is incomplete, the corpus bursae is lacking and this structure is fundamental to diagnosing *P. ochracea*, but even so, the lamella antevaginalis in the *P. ochracea* type genitalia slide preparation is more similar to that of *P. annario* than to that of *P. battyi*, and the corpus bursae of the female *P. ochracea* series examined for this work have nothing to do with that of *P. battyi*. Toulgoët illustrated a full female genitalia of *P. ochracea* in his 1994 revision of *Pseudohemihyalea* and his drawings, which include the corpus bursae match pretty well the female genitalia of *P. ochracea* illustrated in this work. Then, as a conclusion *P. battyi* is considered here a good species and so we have *Pseudohemihyalea battyi*, (Rothschild, 1909) **stat**. **rev**.

Pseudohemihyalea niger (Seitz, 1925), described from Cartago, Volcán Irazú is also a very interesting case, as the type locality is situated in the vicinity where *P. ochracea* and *P. annario* are found. Toulgoët 1992 (note 39) indicated that *P. niger* was a "bona species", but in his 1994 revision of *Pseudohemihyalea*, he rectified that information by pointing out that *P. niger* is a melanic form of *P. ochracea*. The male holotype specimen, type No. 3124 (Fig. 16e) is very dark and by a superficial examination there is no way to associate this taxon with *P. ochracea* nor *P. annario*. As already stablished, the latter taxa show intraspecific variation, but we consider the habitus of *P. niger* to be outside the parameters of variation for both *P. ochracea* and *P. annario*. In contrast to this, the holotype male genitalia of *P. niger*, genitalia slide No. 3124 (Figs 16f, g) look very similar to those of *P. ochracea* and *P. annario*. Nevertheless, the valvae in the holotype genitalia image resemble those of *P. ochracea*, considering that these structures in ventral view do not have the basal portion wider, with a triangular inner projection as in *P. annario*. On the other hand, *P. niger* reminds us *P. montywoodi* **sp**. **n**., one of the darkest species described in this work, but with a totally different shape of uncus, so any association between these two taxa is here discarded. Finally, considering the complexity of this *ochracea-annario* group, as other in *Pseudohemihyalea*, it would be not surprise to find out that *P. niger* can be a valid species. But with the lack of more information about *P. niger*, and with no more specimens than the holotype, and of course, with no DNA sequences of this taxon, the re-validation of this species cannot be proposed and will depend on future analysis, if more evidence can be compiled.

We finally have to refer to *Pseudohemihyalea oligocycla* (Seitz, 1925). A taxon described also from Volcan Irazú in Cartago Province. Images of type specimen are not available. For this species the available image of the supposed female genitalia slide is No. 3147 (NOT TYPE). The image is incomplete as the corpus bursae is lacking. Then, after close examination of the picture, we determined it corresponds to the preparation of the female type of *P. battyi*. Therefore, it is just a close-up of the image No. 3146 (image of *P. battyi* type female genitalia). For *P. oligocycla* male, there is a slide preparation available of a specimen with the number 3120 (Figs 16j, k) (NOT TYPE), genitalia capsule and phallus respectively (NHMUK). Related to this dissection, the genitalia do not differ from that of *P. ochracea*. What makes things confusing about this male preparation is, in my opinion, the position how the structures were placed on the slide. Somehow the valvae looks inverted in the distal portion, and that can be tricky to interpret, but in general terms, no differences can be observed. Then, without more reliable data on *P. oligocycla*, we have not enough elements to properly evaluate any change about the current status of this taxon and so *P. oligocycla* remains as a synonym of *P. ochracea*.

As mentioned at the beginning of this section, sexual association is difficult for some species, as a consequence, three Costa Rican species were described from females only, two of which need to be discussed in this section. One of them, *P. asignata*, described by Reich in 1938 from a single specimen, from San José is known only by its holotype, of which there is only a photograph of the dorsal view available to us. The specimen is deposited in Tel Aviv University and it has been impossible for us to examine it. The drawing of the female genitalia provided by Toulgoët (1994) is incomplete, so the shape of the *corpus bursae* and other internal structures remain unknown to us. Hence the female could be any of the other species of *Pseudohemihyalea*, based on the visible similarities in the shape of the lamella antevaginalis of *P. asignata* with those of other females we studied.

Even though we have no ventral view of *P. asignata*, it is possible to see the distal portion of the abdomen, the tip of the *lamella antevaginalis*, which stand out by its size and looks nearly the same to that of *P. annario*. Because *P. asignata* and *P. annario* are recorded

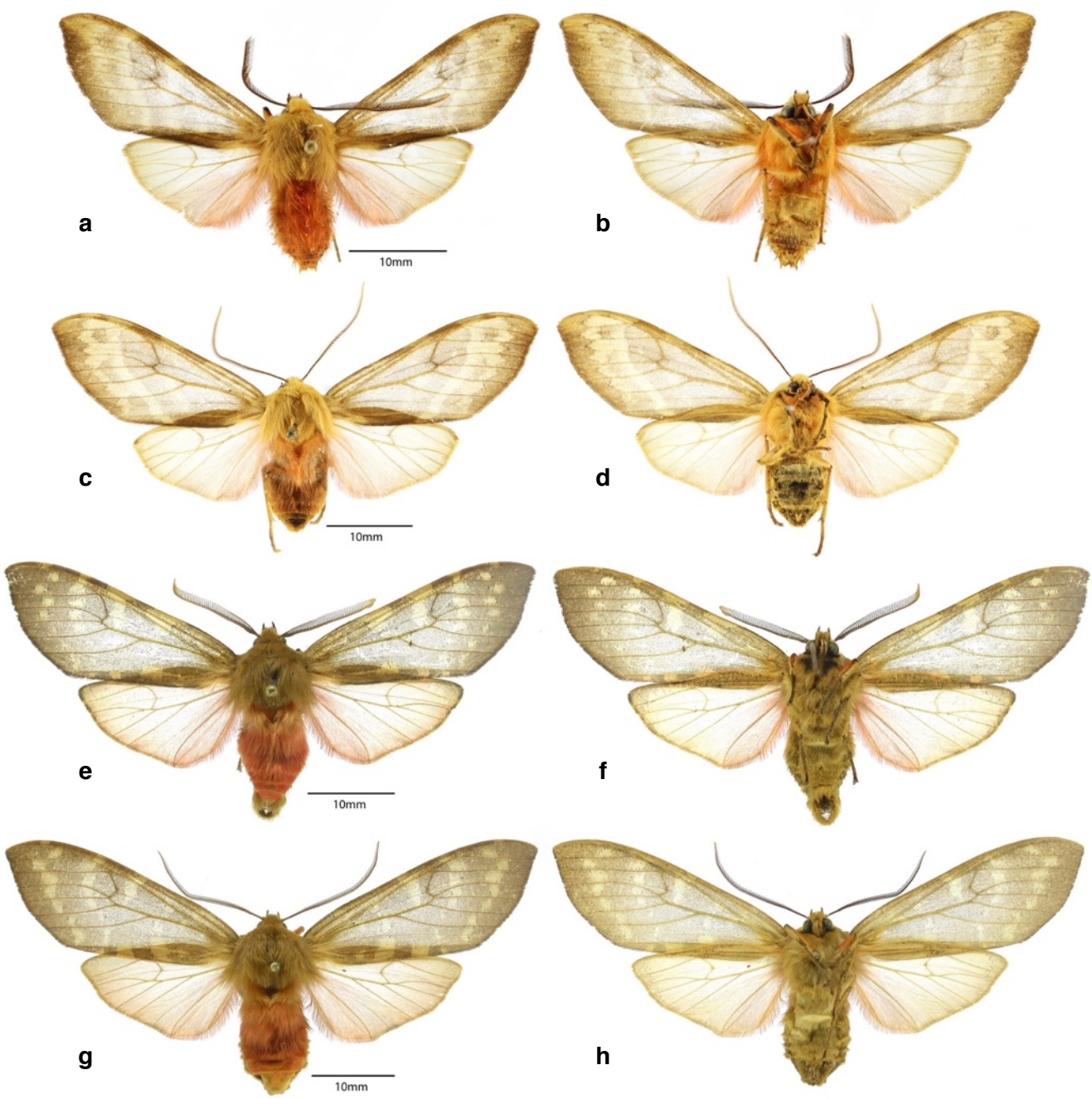

Figure 2. Adults of *Pseudohemihyalea*.

a, **b**. *P. johnbrowni* **sp**. **n**., ♂, INBIOCRI000663960 (H-T). **c**, **d**. *P. johnbrowni* **sp**. **n**., ♀, INB0004313431 (P-T). **e**, **f**. *P. ochracea* (Rothschild, 1909), ♂, 19-BAES-00202. **g**, **h**. *P. ochracea* (Rothschild, 1909), ♀, 19-BAES-00279.

from the same area in the Central Valley of Costa Rica, we provisionally consider *P. asignata* (Reich, 1938) a synonym of *P. annario* (Dyar, 1914), which we also reestablish as a valid species. The result is *Pseudohemihyalea annario* (Dyar, 1914), **stat**. **rev**. and *Pseudohemihyalea asignata* (Reich, 1938), **new syn**.

The second species known only from females is *P. incerta*, described by Toulgoët (1994) from two specimens from Panama-Chiriqui, for which we have no males associated with the series of specimens in MNCR-A. This series shares similar superficial characteristics with a series of males provisionally identified as *P. variabilis*, for which female specimens are unknown. Similarities among adults of these two series (i.e., males and females), and differences in male genitalia between *P. variabilis*, described from Mexico (Oaxaca) and Costa Rican specimens suggest that the two are not conspecific. DNA sequences from both series (i.e., males and females) share the same BIN (BOLD: ABY7370). Therefore, we conclude that Costa Rican males initially identified as *P. variabilis* are actually *P. incerta,* and true *P. variabilis* has a more restricted geographical distribution, probably present only in Mexico and Guatemala. This conclusion is congruent with the information on distributions mentioned by Toulgoët (1994) in his original descriptions of *P. variabilis* and *P. incerta*.

The third taxon described from a female is *P. corralesi* Toulgoët, 1996. This species is well-circumscribed; the female has highly characteristic genitalia that make it unmistakable among others, rendering a discussion unnecessary. The species' genitalia are described in greater detail in this work, as they were only well-illustrated in Toulgoët's original publication.

Another species we review in this work is *Hemihyalea fuscescens* Rothschild, (1909). This species was synonymized with *Hemihyalea rhoda* by Watson & Goodger (1986), the latter described from Guatemala by Druce (1894). Subsequently, it was removed from *Hemihyalea* to *Amastus* by Hervé de Toulgoët (1994) and reestablished as a valid species. During our study we sequenced five specimens of *Hemihyalea fuscescens* from MNCR-A, BioAlfa collections and MLC, and their barcodes link convincingly with the series of *Pseudohemihyalea*. The result is *Pseudohemihyalea fuscescens* (Rothschild, 1909) **new comb**.

On the other hand, based on genetic sequences successfully obtained from a series of selected samples for each of the species, preliminary determined in the local collections of MNCR-A and BioAlfa, by using morphological parameters basically, we were able to determine that in some cases we actually have complexes of two or more hidden species, clearly separated by its DNA, as well as complex of species for which DNA barcoding is shared by two or more species, but clearly separated by morphological patterns and strong differences on male and female genitalia structures. Also, it was possible to define other species as new taxa into *Pseudohemihyalea*. All the results of this work for Costa Rica' *Pseudohemihyalea* species are present here as follow:

Genus ***Pseudohemihyalea*** Rego-Barros, 1956.

Pseudohemihyalea Rego Barros, 1956: 33.
Type species: *Phaegoptera rhoda* Druce, 1894, by original designation.

I. ***Pseudohemihyalea daraba*** (Druce, 1894)

BIN BOLD:ABZ3312
(Fig. 1a, b, 10a-d)

Phaegoptera daraba Druce, 1894a: 173.

Type locality. – Mexico, [Veracruz], Orizaba, Jalapa.

Type specimen. – ♂ SYNTYPE, NHMUK.

Material examined. – **7** ♂, **2** ♀.

COSTA RICA

- **1** ♂, INB0004160707 (Sequenced). Prov. Cartago, La Unión, Z.P. C. Carpintera, Campo Esc. Istarú, 1750 m., 16-17 AGO 2008, R. Rojas, Tp. Luz Mercurio. 9.8905478, -83.9709083. (Deposited MNCR).

GUATEMALA

- **2** ♂, **1** ♀, Zacapa, San Lorenzo Road, 30-IX-2008, 1800 m, J. Monzon leg.,
- **2** ♂ dissected Gen. ML 1811 & 1812.
- **1** ♀, San Marcos, Bojonal, 12-IV-2010, 1600 m, J. Monzon leg.
- **1** ♂, Zacapa, San Lorenzo Road, 6-I-2010, 1800 m, J. Monzon leg.
- **1** ♂, Baja Verapaz, Santa Rosa, 14 & 23-V-2007, 1580 m, M. Laguerre leg., dissected Gen. ML1515 and sequenced: sequenced process ID ARCTC995-11, BOLD ID MILA 1457 (yellow printed label). (Deposited MLC)

Diagnosis. – This species is recognized by having dark brown spots on patagia, a character only shared by *Pseudohemihyalea johnbrowni* **sp**. **n**., but *P. daraba* differs from that species by having hyaline wings, FW with yellowish-ochre on the basal area and along the costal margin, inner margin and outer margin with dark brown, as well as HW with inner margin and anal area with yellowish-orange scales. In contrast with the last point indicated, *Pseudohemihyalea johnbrowni* **sp**. **n**. has also a darker coloration, with more defined patterns.

Description. – Adult male. (Fig. 1a, b). INB0004160707. For adult description, see Druce 1894. Forewing length 23.6 mm (n = 1).

Genitalia. – Male genitalia. (Fig. 10a-d). INB0004160707. Uncus sclerotized, short, thick, spearhead-shaped, curved downward ventrally, acute and prominent lateral edges, densely covered with long strong setae. Anterior margin of tegumen concave, "open V-shaped". Valva broad, ventral margin slightly lobulate near the middle, the tip rounded and slightly concave on the interior surface, costal margin with an acute edge, the tip reduced, rounded and curved inward. Diaphragma very slightly sclerotized and striated. Transtilla sclerotized, with two broad lateral lobes, covered with very thick and short spines. Juxta sclerotized, convex, fused to the lateral lobes of transtilla, with two lateral processes on the lower portion. Aedeagus sclerotized, thick, vesica lobulate, almost totally covered by minute spines that increase in size on the distal portion.

Adult female. – Unknown.

Remarks. – This species, described from Mexico, [Veracruz], Orizaba, Jalapa is represented in Costa Rica, in the MNCR-A collections by only one specimen male collected from La Unión de Cartago at 1750 m elevation in Campo Esc. Istarú, which belongs to Cordillera de Talamanca. So, considering the multiple field trips to different localities of Cordillera de Talamanca, between 2019 and 2022, from which good series of different *Pseudohemihyalea* species were collected from the light traps, excepting *P. daraba*, is an indicative to consider this species as rare in the country and probably very restricted to a specific habitat and with specific periods of activity through the year. This CR specimen was successfully sequenced and it matches a male specimen collected by Michel Laguerre from Guatemala, Santa Rosa, Baja Verapaz, also successfully sequenced and both samples align perfectly in the BIN: BOLD:ABZ3312. Additionally, both male specimens from Guatemala and CR were dissected and compared finding no differences on the genitalia structures. Finally, after comparison with available male genitalia images of the specimen syntype *Phaegoptera daraba*, Arctiidae genitalia slide No. 3118, photographed B.M. negative 44274, it can be confirmed with great certainty the identity and presence of *P. daraba* in Guatemala and in Costa Rica.
Related to the series of *P. daraba* deposited in the MNHN, it is striking that *P. daraba*'s drawer contains specimens clearly different in forewing patterns, which may be congruent with Toulgoët's concept of intraspecific variation in adults of many of the species of *Pseudohemihyalea* and so *P. daraba* was probably interpreted as a polymorphic species too, which is clearly not after confirmation by DNA sequences and dissection of specimens with marked differences on forewing patterns of CR specimens examined in this work.

II. ***Pseudohemihyalea donharveyi*** Espinoza **sp**. **n**.

BIN BOLD:ABY9848
(Fig. 1c-f, 10e-h, 14a)
ZooBank: https://zoobank.org/6353DFBB-B131-4B92-8808-630A5BB3F0BD

Material examined. – **20** ♂, **11**♀.

Holotype, ♂, INB0004184805, (Sequenced). COSTA RICA, Prov. Cartago, La Unión, Z. P. C. Carpintera, Campo Esc. Istarú, 1750 m., 1-4 Dec 2008, Moraga, Azofeifa, Zumbado, Hernández. Luz Mercurio, 9.8905478, -83.9709083. #95368.

Paratypes

COSTA RICA

- **1** ♂, 19-BAES-00120. (Sequenced). Cartago, Macizo de la Muerte, P. Nac. Tapantí, Puente Río Humo, 1517 m. 30-31Julio-2019. Col. B. Espinoza. 9.703485 -83.782024. Manta #;
- **1** ♂, INB0004160611. (Sequenced). Prov. Cartago, La Unión, Z. P. C. Carpintera, Campo Esc. Istarú, 1750 m., 16-17 AGO 2008. R. Rojas. Tp. Luz Mercurio, #94572;
- **1** ♂, INB0004158722. (Sequenced). Same locality, 24 JUL 2008, J. Azofeifa, B. Hernández, M. Moraga, M. Zumbado. Luz Mercurio, #94439;
- **1** ♂, INB0004184253. (Sequenced). Prov. Cartago, La Unión, Z. P. C. Carpintera, El Tanque, 1600-1700 m., 14 DEC 2008. Moraga, Azofeifa, Zumbado, Hernández. Luz Mercurio. 9.8903275, -83.9759233, #95369;
- **1** ♂, 19-BAES-00055. (Sequenced). Prov. Cartago, Macizo de la Muerte, P. Nac. Tapantí, Puente Río Humo, 1517 m. 30-31Julio-2019. Col. B. Espinoza. 9.703485 -83.782024. Manta #1;
- **1** ♂, INB0003506982. Prov. Cartago, Tapanti, Rio Grande de Orosi, 1300-1400 m., 8-9 Jul 1986, D.H. Janzen & W. Hallwachs, 9.7705556, -83.7752778;
- **1** ♂, INB0003451246. Prov. Puntarenas, Monteverde, 20-21 Jul 1982, 1300-1400 m., D.H. Janzen & W. Hallwachs, 10.3052006, -84.7989444;
- **1** ♂, INBIOCRI002218295. Prov. Puntarenas, PILA-ACLA, Estac. Pittier, 1670 m., 23 ENE-2 FEB 1995, F. Alvarado. 9.0256639, -82.9626953, #4451;
- **1** ♂, INB0003450026. Prov. Cartago, El Guarco, San Isidro, 3 Km S. Casa Mata, 16 Km S. San Isidro de Tejar, 1800 m., 04 DEC 1983, D. H. Janzen, 9.7601433, -83.9815436;
- **1** ♂, INB0003366225. Prov Cartago, Paraíso, P. N. Tapantí, 10-12 SEPT 1999, B. Espinoza-S. Red de Golpe. 9.7363503, -83.7806278, #64500;

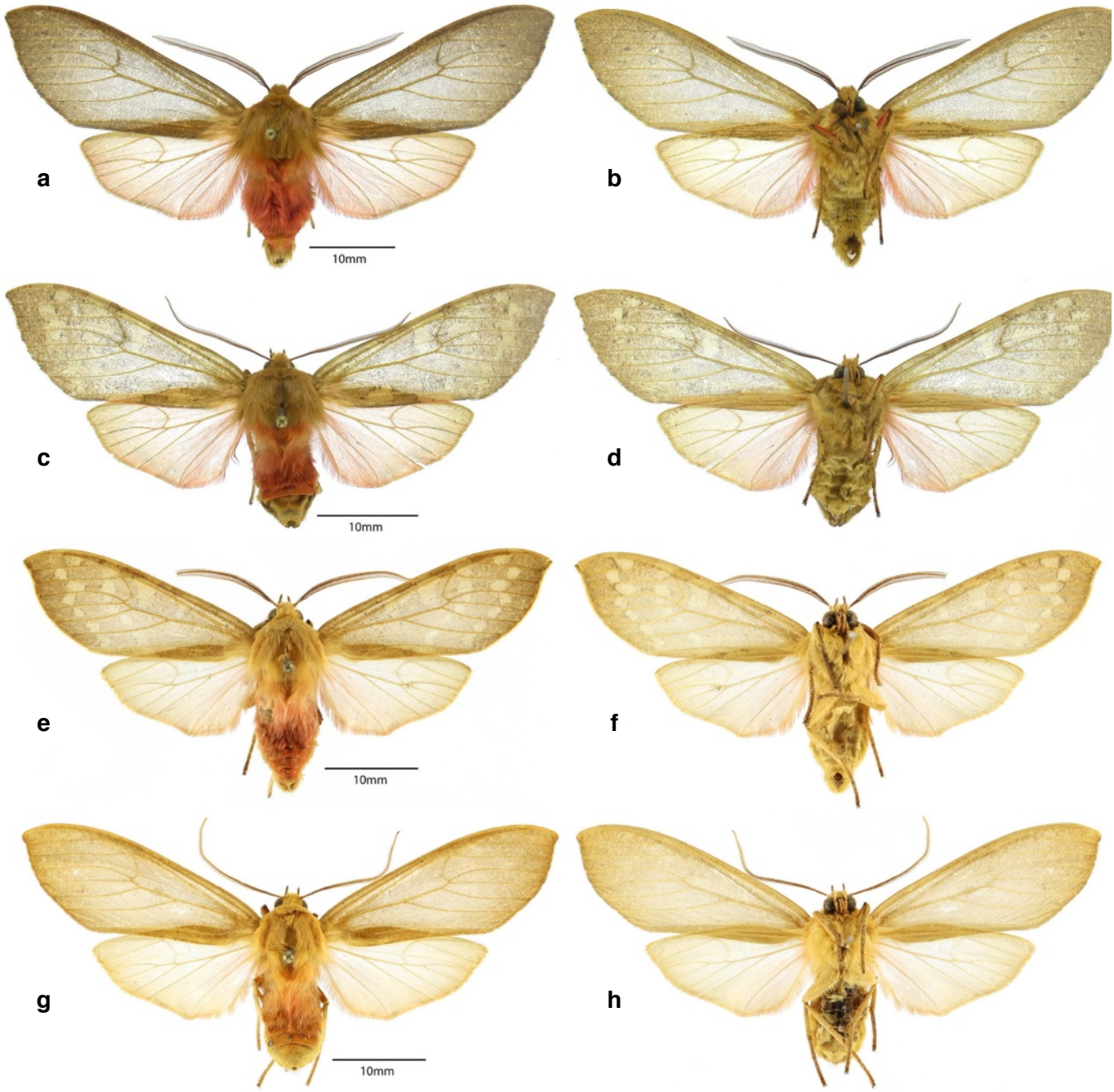

Figure 3. Adults of *Pseudohemihyalea*.

a, **b**. *P. annario* (Dyar, 1914), ♂, 19-BAES-00278. **c**, **d**. *P. annario* (Dyar, 1914), ♀, 19-BAES-00207. **e**, **f**. *P. incerta* Toulgoët, 1994, ♂, INB0004312762. **g**, **h**. *P. incerta*, Toulgoët, 1994, ♀, INB0004313120.

- **1** ♂, INBIOCRI002566203. (Dissected). Prov. Puntarenas, Est. Pittier, Send a cerro Pittier, 1 Km N. de la Estación. 1800-2000 m., 05 JUN 1997. M. Moraga. 9.0338019, -82.9626797, #46819;
- **1** ♀, 19-BAES-00121. (Sequenced). Prov. Cartago, Macizo de la Muerte, P. Nac. Tapantí, Puente Río Humo, 1517 m. 30-31Julio-2019. Col. B. Espinoza. 9.703485 -83.782024. Manta #1;
- **1** ♀, INBIOCRI000532249. Prov. San José, P. N. Braulio Carrillo, 500 m antes del Tunel, Est. Zurqui, 1600 m., G. Maass, May 1991. 10.0575000, -84.0122222;
- **1** ♀, INBIOCRI002483269. Prov. Puntarenas, Estación Altamira, 1 Km. S del Cerro Biolley. 1300-1400 m., 20-30 Oct 1996, R. Villalobos, de Luz, 9.0329867, -83.0108869, #44657.
- **1** ♀, INB0004264182. Prov. Cartago, Paraíso, P. N. Tapantí-Macizo de La Muerte, La Represa, camino al tunel de Río Humo y sector de la Quebrada, 1750 m., 8-10 Sept 2010, B. Espinoza. Tp de Luz, 9.7092208, -83.7811264, #99954;
- **2** ♀, INB0003506793, INB0003506794. Prov. Puntarenas, Las Nubes, 11 Km NW Monteverde. 31 Jul 1981. D.H. Janzen & W. Hallwachs, 10.3593800, -84.8446814. (Deposited MNCR).

COSTA RICA

- **1** ♂, **3** ♀, Puntarenas, P.N. Monteverde, 22-IX-2009, 1532 m, D. Herbin leg.,
- **1** ♀ is dissected Gen. ML 2015 and sequenced: sequenced process ID ARCTC1015-11, BOLD ID MILA 1477 (yellow printed label);
- **1** ♂, Cartago, P.N. Tapanti, 11-IX-2009, 1632 m, D. Herbin leg.;
- **1** ♂, Cartago, P.N. Tapanti, 6-V-2010, 1632 m, M. Laguerre leg. (Deposited MLC).
- **5** ♂, **1** ♀, Alajuela, P.N. Juan Castro Blanco, 7-V-2005, 1600 m, B. Vincent leg., **1** ♂, sequenced: sequenced process ID ARCTD374-12, BOLD ID BEVI1679. (Deposited BVC).

Diagnosis. – This species is related to *P. daraba* due the adult similarities they share to each other. Although characterized by the

presence of a blackish iridescent dot basally on the tegula, which is also present in *P. daraba*, it differs from that species by the darker color patterns on FW.

Description

Adult male (Fig. 1c, d). INB0004184805.

Forewing length 23.0-24.42 mm (n = 12). Head and thorax fawn-color. Palpus upturned, not reaching the vertex of head, creamy-yellowish with dark brown laterally, third segment minute. Antenna bipectinate, dark brown, almost 3/4 the length of wing. Tegula with a basal blackish iridescent dot. Legs light yellowish brown, with dark brown tarsi, anterior leg with orange dorsal surface on femur, middle leg with a dark brown spot on tibia basally, posterior leg with some orange on dorsal surface of tibia. Forewing elongate, semihyaline with a light yellowish brown background color, a basal diffuse brown circular spot, three transversal diffuse dark brown bands, sinuous-shaped from costal margin to the anal margin, between post basal area and postmedial area; a fourth postmedial diffuse light brown band, subterminal area brown with the internal margin undulate and dark brown, outer margin and inner margin dark brown, ventrally as dorsally, but slightly washed out. Hindwing hyaline, anal margin orange-pink, an apical dark brown spot, costal margin creamy, ventrally as above. Abdomen reddish-orange dorsally and light yellowish brown ventrally.

Male genitalia (Fig. 10e-h). 19-BAES-00120.

Uncus short, thick, sclerotized, strongly curved downward ventrally, basal half strongly concave, with lateral edges strongly pronounced, a short dorsal rounded protuberance distally, sharpened edge, uncus tip acute. Anterior margin of tegumen open "V" shape. Valva sclerotized, rectangular, costal margin straight, with a strongly curved inward and rounded tip; interior surface of the tip scarcely covered by moderately long bristles; ventral margin straight, very slightly constricted on the middle, the tip pointed and curved inward and upward dorsally. Transtilla sclerotized, with two lateral short projections triangular-shaped, with a spinulate tip. Juxta very slightly sclerotized, convex. Aedeagus thick, short, anterior end lobulate, vesica short, lobulate, with two short lobes, one basally arising dorsally, slightly curved to the left side and projecting anteriorly, covered with thick short spines and a second shorter and thick lobe ventrally near the base of vesica, bent-shaped, covered with tiny spines and with a rounded tip, which turns to its right. A large, dense patch of thick spines on distal surface, decreasing in size toward the basal part of vesica, which runs dorsal and ventrally.

Adult female (Fig. 1e, f). 19-BAES-00121.

No sexual dimorphism is present. Female size slightly larger than in male. Forewing length 25.74-27.62 mm (n = 06).

Female genitalia (Fig. 14a). 19-BAES-00121.

Papilla analis basically rectangular-shaped, covered by a combination of short and long bristles and a distinctive patch of short setae on dorsal portion. Anterior apophysis and posterior apophysis the same size, ostium bursae simple and membranous, ductus bursae short, sclerotized, flattened dorso-ventrally, lamella antevaginalis very slightly sclerotized, with a notch in the middle and slightly pronounced laterally and with a rounded edge. Corpus bursae lobulate, simple, accessory bursae lobulate, arising basally and to the right behind the junction of ductus bursae and corpus bursae.

Etymology. – *Pseudohemihyalea donharveyi* **sp**. **n**. is named after Dr. Donald James Harvey, a great retired lepidopterist who dedicated many years studying moths and butterflies at the Smithsonian Institute and who always collaborated in many ways when the authors of this work needed to check the Smithsonian collections.

Remarks. – This is one of the complex species mixed and misidentified as *P. daraba* in main collections due to the adult similarities shared with the true *P. daraba*. Hervé de Toulgoët identified a series of eight specimens from Costa Rica as *P. daraba* of which none of them belonged to that species, but to this new species described here for which the DNA barcoding fully confirmed its identity.

III. ***Pseudohemihyalea anaisabelsanabriae*** Espinoza **sp**. **n**.

BIN: BOLD:ACE7168

(Fig. 1g-j, 10i-l, 14b)

ZooBank: https://zoobank.org/38832F60-EA5C-4A59-AF9A-1B8FF92D54DC

Material examined. – **16** ♂, **5** ♀.

Holotype, ♂, 19-BAES-00062 (Sequenced), (Dissected). COSTA RICA, Cartago, Macizo de la Muerte, P. Nac. Tapantí, Puente Río Humo, 1517m. 30-31Julio-2019. Col. B. Espinoza. 9.703485 -83.782024. Manta #1 (Deposited MNCR)

Paratypes

COSTA RICA

- **1** ♂, INB0004072459. (Sequenced). Prov. Limón, P.I. La Amistad Caribe. Camp. 2: Río Coen, orilla campamento. 1700-1800 m, 22 Feb. 2007. B. Gamboa, M. Moraga. Tp. Luz, 9.3830556, -83.2133333, #9731;
- **1** ♂, 19-BAES-00063. (Sequenced). Prov. Cartago, Macizo de la Muerte, P. Nac. Tapantí, Puente Río Humo, 1517m, 30-31Julio-2019. Col. B. Espinoza. 9.703485 -83.782024, Manta #1;
- **1** ♂, INBIOCRI000339070. Prov. Cartago. Ref. Nac. Fauna Silv. Tapantí, 1250 m, AGO 1991, G. Mora, 9.7625833, -83.7883281;
- **1** ♂, INB0003116383. Prov. Cartago, Paraíso, P. N. Tapantí_Macizo de La Muerte, Estación Quebrada Segundo, 1300 m, NOV 2000, R. Delgado, de Luz, 9.7625833, -83.7883281, #60869;
- **1** ♂, INBIOCRI001768264. Prov. Cartago, P.N. Tapantí, 1300 m, ABR 1994, G. Mora, 9.7625833, -83.7883281, #2813;
- **1** ♂, INBIOCRI001293539. Prov. Cartago, P. N. Tapantí, Quebrada Segunda, 1250 m, ABR 1993, G. Mora. 9.7625803, -83.7865053;
- **1** ♂, INBIOCRI000656355. Prov. Cartago, Ref. Nac. Fauna Silv. Tapantí, 1250 m, G. Mora, JUL 1991, 9.7625833, -83.7883281;
- **3** ♂, INB0003446525, INB003446523, INB003446524. Cartago Prov., Tapantí, Río Grande de Orosi, 1300-1400 m, 17 NOV 1982. D. H. Janzen & W. Hallwachs. 9.7705556, -83.7752778;
- **2** ♂, INB003447069, INB003447067. Prov. Cartago, Tapantí, Río Grande de Orosi, 1300-1400 m, 23 JAN 1985. D. H. Janzen & W. Hallwachs, 9.7705556, -83.7752778;
- **1** ♂, INB0003079923. Prov. Cartago, Paraíso, P. N. Tapantí-Macizo de la Muerte, al costado de Casa Adm., 1200 m, JUN 2000. L. Chavarria. De Luz, 9.7616761, -83.7865069, #56770;
- **1** ♂, INBIOCRI000339044. Prov. Cartago, Ref. Nac. Fauna Silv. Tapantí, 1250 m, G. Mora, AGO 1991. 9.7625833, -83.7883281;
- **1** ♀, 19-BAES-00597. (Sequenced). Cartago, Macizo de la Muerte, P. Nac. Tapantí, Puente Río Humo, 1517 m, 30-31Julio-2019. Col. B. Espinoza. 9.703485 -83.782024. Manta #1;
- **1** ♀, INB003447442. Prov. Cartago, Tapantí, Río Grande de Orosi, 1300-1400 m, 09 APR 1984. D. H. Janzen & W. Hallwachs. 9.7705556, -83.7752778;
- **1** ♀, INBIOCRI001768281. Prov. Cartago, P. N. Tapantí, 1300 m, ABR 1994, G. Mora, 9.7625833, -83.7883281, #2813;
- **1** ♀, INB003447068. Prov. Cartago, Tapantí, Río Grande de Orosi, 1300-1400 m, 23 JAN 1985, D. H. Janzen & W. Hallwachs. 9.7705556, -83.7752778;
- **1** ♀, INB003446522. Prov. Cartago, Tapantí, Río Grande de Orosi, 1300-1400 m, 17 NOV 1982. D. H. Janzen & W. Hallwachs, 9.7705556, -83.7752778. (Deposited MNCR).
- **1** ♂, Cartago, P.N. Tapanti, 9-V-2010, 1515 m, M. Laguerre leg., dissected Gen. ML4010. (Deposited MLC).

Diagnosis. – This species can be recognized by its evident smaller size compared with other of the species into the *P. daraba* cryptic complex. The transversal irregular and diffuse dark brown broad band from costal margin to inner margin, which extends over the basal area and to the costal margin basally is also characteristic of *Pseudohemihyalea anaisabelsanabriae* **sp**. **n**.

Description

Adult male (Fig. 1g, h). 19-BAES-00062.

Forewing length 19.64-21.97 mm (n = 15). Head and thorax fawn-color. Palps short, robust, dark brown, with a patch of light yellowish brown elongated scales on middle segment ventro-laterally, third segment minute, vertex of head hairy. Antenna bipectinate, half the

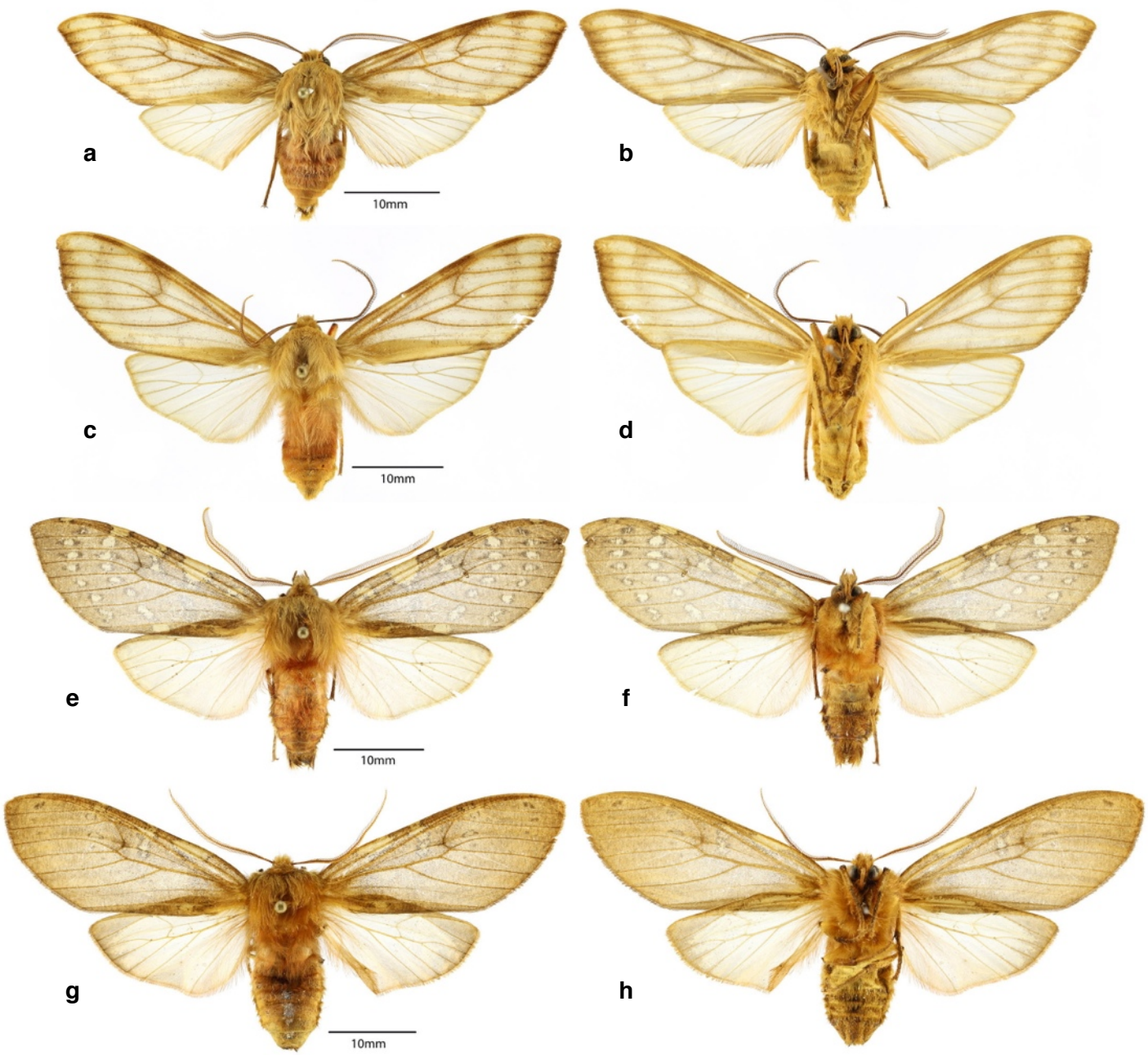

Figure 4. Adults of *Pseudohemihyalea*.

a, **b**. *P. anapheoides* (Rothschild, 1909), ♂, INB0004067995. **c**, **d**. *P. anapheoides* (Rothschild, 1909), ♀, INB0003793030. **e**, **f**. *P. celsicola* (Toulgoët, 1982), ♂, INB0004313252. **g**, **h**. *P. celsicola* (Toulgoët, 1982), ♀, INB0004313253.

length of wing, brown color, with a lighter tip. Thorax hairy, tegula slightly darker on the interior margin. Legs light yellowish brown with dark brown patches on femora, tibiae and tarsi, anterior leg with orange on femur and on tibia. Forewing elongated, semihyaline, with a light yellowish brown background color, a transversal irregular and diffuse dark brown broad band from costal margin to inner margin, which extends over the basal area and to the costal margin basally. Outer margin dark brown, inner margin dark brown, except basally, ventrally as above. Hindwing semihyaline, with a light yellowish brown background color, anal area light orange, outer margin with dark brown cilia. Abdomen light orange dorsally and fawn-color ventrally.

Male genitalia (Fig. 10i-l). 19-BAES-00062 (H-T).

Uncus dorsally short, thick, rectangular on the basal half and triangular on the distal half, with a pointed tip, concave longitudinally on dorsum, concavity from base and ¾ the length of uncus, uncus almost totally covered by short thick setae, except on the concavity and on the tip. In lateral view, uncus thick, curved downward ventrally, with a dorsal rounded protuberance distally, sharpened edge and uncus tip acute. Anterior margin of tegumen "opened-V" shape. Valvae sclerotized, rectangular, costal margin bulbous at the tip, slightly curved inward, dorsal surface flattened dorso-ventrally, with the outer margin sharpened. Ventral margin straight, with a narrow tip, moderately covered by thick bristles. Transtilla sclerotized, with two very short lateral protuberances, adorned with tiny spines. Juxta slightly sclerotized, strongly convex. Aedeagus sclerotized, thick, anterior end lobulate, vesica short, lobulate, arising to the left in dorsal view, with thick and minute spines on distal surface and a short lobe arising ventrally near the basal portion.

Adult female (Fig. 1i, j). 19-BAES-00597.

No sexual dimorphism is present. Female a little bit bigger than male. Forewing length 23.00-24.09 mm (n = 05).

Female genitalia (Fig. 14b). 19-BAES-00597.

Papillae anales rectangular shape, scarcely covered with long bristles, a dense patch of short setae dorso-laterally on the basal margin. Anterior apophyses slightly shorter than posterior apophyses, ostium bursae simple and membranous, ductus bursae slightly sclerotized, short, broad, flattened dorso-ventrally, corpus bursae large, lobed, noticeable narrow

in the basal portion and slightly striate on basal half ventrally, a diffuse patch of short and minute spines on the internal surface ventrally. A rounded accessory bursae arising basally behind the junction of corpus bursae with ductus bursae.

Etymology. – *Pseudohemihyalea anaisabelsanabriae* **sp**. **n**. is named in honor of Mrs. Ana Isabel Sanabria Rubí, mother of the first author, in recognition of her unconditional love and dedication she has always shown to her entire family.

Remarks. – Material of this species was firstly examined and misidentified as "*P. daraba"* due to its adult's similarities shared with the true *P. daraba* and so this species was hidden for long time and *P. daraba* has been treated in the main collections of the world (NHMUK, MNHN and USNM) as a polymorphic species, when in reality it is not.

IV. ***Pseudohemihyalea johnbrowni*** Espinoza **sp**. **n**.

BIN BOLD:ABW9443

(Fig. 2a-d, 10m-p, 14c)

ZooBank: https://zoobank.org/8FFEEB06-F5CA-4810-BC61-1522E42CFB97

Material examined. – **15** ♂, **12** ♀.

Holotype, ♂, INBIOCRI000663960. COSTA RICA, Prov. Heredia, P. N. Braulio Carrillo, Est. Barva, G. Rivera, OCT 1989, 10.1331750, -84.1211306. (Deposited MNCR).

Paratypes

COSTA RICA

- **2** ♂, INB0004313261, INB0004313262. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, altura km 95, 1 km antes de la Georgina (Casa del Sr. Hilario), 3200 m, 24-27 JUL 2007. B. Espinoza. Tp. de Luz, 9.5625278, -83.7331603, #103639;
- **2** ♂, INB0004313418, INB0004313405. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, km 92, Finca Los Nímbolos, 3300 m, 24-27 JUL 2007. B. Espinoza. Tp. de Luz, 9.5617972, -83.74091944444444, #103640;
- **1** ♂, 19-BAES-00230. (Sequenced), (Dissected). Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, Camino del Portón a Bosque Robledal, 2841 m, 29-30 de Agosto de 2019. Col. B. Espinoza, 9.557477, -83.686681;
- **1** ♂, 22-BAES-01954. Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, Camino del Portón a Bosque Robledal. 2841 m, 30 de Mayo de 2022. Col. B. Espinoza. 9.557477, -83.686681;
- **1** ♂, INB0003456772. Prov. Alajuela, Volcán Poás, 2350 m, 12 July 1982, D. H. Janzen & W. Hallwachs. 10.1197472, -84.2363583;
- **2** ♂, INBIOCRI000089254, INBIOCRI000140022. Prov. Heredia, Braulio Carrillo N. P. Est. Barva, 2500 m, 01-30 NOV 1989, G. Rivera, 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI000663936. Prov. Heredia, P. N. Braulio Carrillo, Est. Barva, 2500 m, G. Rivera, OCT 1989. 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI000663934. Prov. Heredia, P. N. Braulio Carrillo, Est. Barva, 2500 m, G. Rivera, 01-31 OCT 1989. 10.1331750, -84.1211306;
- **1** ♂, MNCR-A 05152392. Prov. Cartago, 1Km NE Cerro Asunción, Cerro de la Muerte, 3100 m, 08 APR 1984, D. H. Janzen & W. Hallwachs, 9.5778897, -83.7532025;
- **1** ♂, INBIOCRI001952720. Prov. Cartago, A. C. Amistad, Villa Mills, Quebrada Muerte, 3120 m, 07 JUL 1993, J. F. Corrales. 9.5607136, -83.7395356, #2290;
- **1** ♂, INB0003456774. Prov. Alajuela, Volcán Poás, 2350 m, 12 July 1982, D. H. Janzen & W. Hallwachs. 10.1197472, -84.2363583;
- **1** ♂, INBIOCRI000142952. (Dissected). Prov. Heredia, P. N. Braulio Carrillo, Est. Barva, 2500 m, 01-30 NOV 1989. A. Fernandez. 10.1331750, -84.1211306;
- **1** ♀, INB0003327972. (Sequenced). Prov. Cartago, El Guarco, Villa Mills – CATIE, 2840 m, 26-28 OCT 2000, R. Delgado, De Luz. 9.5583333, -83.6916667; #63093;
- **1** ♀, 19-BAES-00215. (Sequenced). (Dissected). Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, 2841 m, 29-30 de Agosto de 2019. Col. B. Espinoza. 9.56351, -83.71;
- **3** ♀, INB0004313431, INB0004313628, INB0004313412. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, km 92, Finca Los Nímbolos, 3300 m., 24-27 JUL 2007. B. Espinoza. Tp. de Luz, 9.5617972, -83.74091944444444, #103640;
- **1** ♀, INBIOCRI000140021. Prov. Heredia, P. N. Braulio Carrillo, Est. Barva, 2500 m, NOV 1989, G. Rivera. 10.1331750, -84.1211306;
- **1** ♀, INB0003569116. Prov. Cartago, 24 Km S. El Empalme, ICE Tower 46, Cerro de la Muerte, 2700 m., 03 JUL 1986. I. Gauld, J. Thompson. 9.5806022, -83.7532033;
- **2** ♀, INB0003569412, INB0003569410. Prov. San José, Cerro de la Muerte, San Gerardo de Dota, 23 AUG 1981, D. H. Janzen & W. Hallwachs. 9.5543647, -83.8078478;
- **1** ♀, INB0003511944. Prov. Alajuela, Volcán Poás, 2350 m, 12 July 1982, D. H. Janzen & W. Hallwachs. 10.1197472, -84.2363583;
- **1** ♀, MNCR-A 05152393. Prov. Alajuela, Volcán Poás, 2350 m, 15 DEC 1982, D. H. Janzen & W. Hallwachs. 10.1197472, -84.2363583, #000059249;
- **1** ♀, INB0004313274. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, altura km 95, 1 km antes de la Georgina (Casa del Sr. Hilario), 3200 m, 24-27 JUL 2007, B. Espinoza, Tp de Luz, 9.5625278, -83.7331603, #103639. (Deposited MNCR).

Diagnosis. – A minute creamy-white dot basally on the origin of anal veins is characteristic of this species and not shared by any of the other *Pseudohemihyalea* species present in Costa Rica, as well as male genitalia with a large circular wrinkled area, "brain"-shaped, very slightly sclerotized on diaphragma. This last character is only shared by *P. daraba*, but that species has hyaline wings and the other male genitalia structures are clearly different in shape.

Description

Adult male (Fig. 2a, b). INBIOCRI000663960.

Forewing length 23.73-25.86 mm (n = 16). Head and thorax fawn-color. Palpi short, slightly curved upward, basal and medial segments dark brown laterally, distal segment very small and totally dark brown, antenna bipectinate, brown and barely exceeding half the wing length. Legs light yellowish brown with patches of dark brown on femora, tibiae and tarsi. Anterior femur pink, medial and posterior femur with some pink. Forewing elongated, semihyaline with a light yellowish brown background color, a minute creamy-white dot basally on the origin of anal veins, diffuse dark brown transversal bands on postbasal, medial and subterminal areas, subterminal band discontinuous, terminal area and outer margin with a dark brown band, which is undulated on the interior margin, a discocellular suffused dark brown spot, inner margin dark brown, except basally, ventral surface as above. Hindwing semihyaline, with the anal area pink and costal and outer margin light yellowish brown. Abdomen pink dorsally and light yellowish brown ventrally.

Male genitalia (Fig. 10m-p). 19-BAES-00230.

Uncus broad, sclerotized, curved downward ventrally, very slightly bilobed basally in dorsal view, strongly concave and with large lateral rounded projections on the basal half, distal half reduced, with a pointed tip, covered with moderately large and strong setae basally and laterally, anterior margin of tegumen "V"-shaped. Valvae sclerotized, broad, costal margin straight, with a sharpened edge, which is slightly concave on the distal part, with a rounded and curved inward tip, ventral margin straight, with a pointed, curved inward and slightly upward tip, internal surface moderately covered by strong setae medially, along the ventral margin, and at the tip of costal margin. Diaphragma with a large circular wrinkled area, "brain"-shaped, very slightly sclerotized. Transtilla strongly sclerotized, with two short, lateral projections, densely covered with short and thick spines. Juxta sclerotized, convex. Aedeagus sclerotized, slightly curved dorsoventrally, anterior end slightly thicker. Vesica short, lobulated, with a short, rounded lobe basally, arising on the left, a second short lobe distally on the right, elbow-shaped, a large dorso-ventral patch of tiny thick spines on the medial area of the vesica.

Adult female (Fig. 2c, d). INB0004313431.

Female a little bigger than male. No sexual dimorphism is present. Forewing length 25.05-28.79 mm (n = 12).

Female genitalia (Fig. 14c). 19-BAES-00215.

Papilla analis in general terms with a rectangular shape, a small rounded lobe near the dorsal edge, surface covered with a combination of large and short setae, a dense, dorso-lateral patch of short setae near the basal margin.

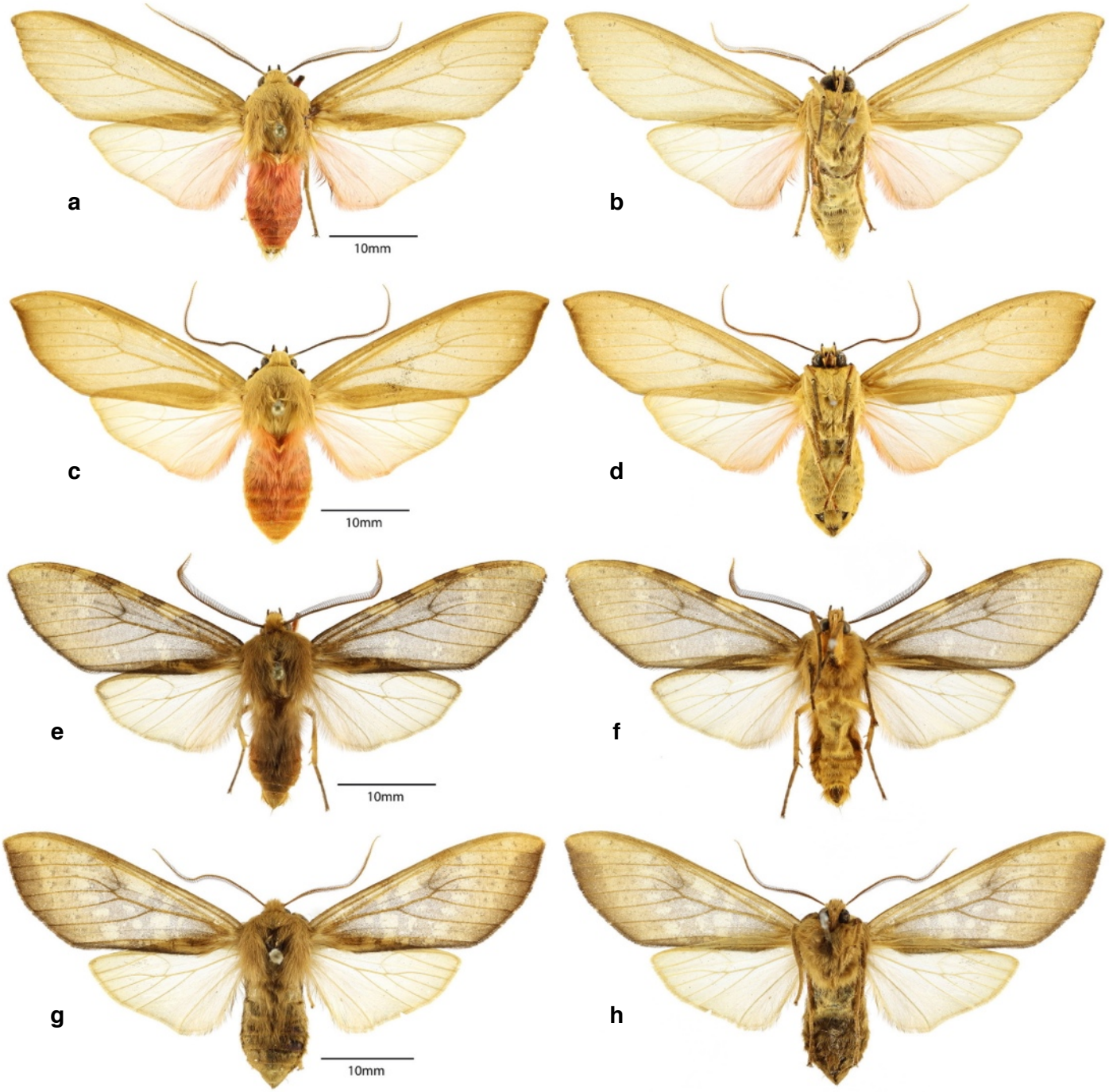

Figure 5. Adults of *Pseudohemihyalea*.

a, **b**. *P. schausi* (Rothschild, 1935), ♂, INB0004188199. **c**, **d**. *P. schausi* (Rothschild, 1935), ♀, INB0004239270. **e**, **f**. *P. carteronae* (Toulgoët, 1982), ♂, INB0004313472. **g**, **h**. *P. carteronae* (Toulgoët, 1982), ♀, INB0004313376.

Anterior apophyses the same length than posterior apophyses, ostium bursae flattened, simple and membranous. Lamella antevaginalis slightly sclerotized, with a short, rounded protuberance on the middle and lateral, pronounced, rounded-shaped lobes, flattened dorsoventrally. Ductus bursae moderately long, sclerotized, flattened dorso-ventrally. Corpus bursae short, rounded-shaped, with a wrinkled area basally on the ventral surface, accessory bursae lobulated, slightly larger than corpus bursae.

Etymology. – *Pseudohemihyalea johnbrowni* **sp**. **n**. is dedicated to Dr. John W. Brown in recognition of his many years of taxonomic contributions to the national biodiversity inventory of Costa Rica.

Remarks. – This is another of the species that is confused with and misidentified as *P. daraba* in main collections due to its similarities shared with the true *P. daraba*, particularly by the translucent wings, but clearly differentiated by its DNA and genitalia structures.

V. ***Pseudohemihyalea ochracea*** (Rothschild, 1909)
BIN BOLD:ABZ6561
(Fig. 2e-h, 11a-d, 14d, 15 a, c, f, 16 a, b)

Hemihyalea ochracea Rothschild, 1909: 213.

Type locality. – [Panama], [Chiriqui], Volcano de Chiriqui.

Type specimen. – Holotype female (BMNH).

Material examined. – **30** ♂, **3**♀.

COSTA RICA

- **29** ♂, 19-BAES-00198. (Dissected), 19-BAES-00199, 19-BAES-00200, 19-BAES-00201, 19-BAES-0020, 19-BAES-00202, 19-BAES-00203, 19-BAES-00204, 19-BAES-00209, 19-BAES-00210, 19-BAES-00211, 19-BAES-00212, 19-BAES-00213, 19-BAES-00214, 19-BAES-00216, 19-BAES-00217, 19-BAES-00218, 19-BAES-00219, 19-BAES-00220,

19-BAES-00258, 19-BAES-00259, 19-BAES-00260, 19-BAES-00261, 19-BAES-00262, 19-BAES-00263, 19-BAES-00266, 19-BAES-00267, 19-BAES-00268, 19-BAES-00277. Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, 2841 m, 29-30 de Agosto de 2019. Col. B. Espinoza. 9.5537777778, -83.6898611111, #72178;
- **1** ♂, 19-BAES-00228. Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, Camino del Portón a Bosque Robledal, 2841 m, 29-30 de Agosto de 2019. 9.557477, -83.686681;
- **1** ♀, INB0003554654. Prov. Cartago, El Guarco, Macizo de la Muerte, Sector de la Esperanza, 2650 m, 01 NOV 2002, R. Delgado, Trampa de Luz, 9.686771, -83.878;
- **2** ♀, 19-BAES-00207 (Dissected), 19-BAES-00279 (Dissected). Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, 2841 m, 29-30 de Agosto de 2019. Col. B. Espinoza. 5537777778, -83.6898611111. (All sequenced). (Deposited MNCR).

Diagnosis. – This is a highly polymorphic species, that may have strongly marked forewing patterns, like presence of transversal brown bands, to a slightly irrorate and uniform maculation. On the genitalia, the valva is characterized by having a truncate apex and two lateral short processes on the basal part of uncus, resembling the deer horns shape. *P. ochracea*, although having similar genitalia to those of *P. annario*, these structures are slightly different in shape between both species, particularly the dorsal process at the base of uncus with lateral short projections, deer horns shape, which differ in form and position from one species to the other.

Description

Adult male (Fig. 2e, f). 19-BAES-00202.

Forewing length 26.80-30.21 mm (n = 29). Head and thorax light yellowish brown. Palpi moderately long, not reaching vertex of head, dark brown laterally, distal segment small and with a lighter tip, antenna bipectinate, half the wing length, brown color, scape and pedicel yellowish. Legs light yellowish brown, with dark brown patches and with dark brown tarsi. Anterior leg with an orange femur and a longitudinal orange stripe on tibia. Forewing elongated, semihyaline with a light yellowish-brown background color, slightly irrorate, with presence of transversal brown bands, variable in number and irregular shape or with a uniform maculation forewing. Hindwing semihyaline, with a slightly light yellowish orange background tone, anal area with an orange pink hue, outer margin light yellowish orange. Abdomen orange pink, last segment light yellowish brown, ventrally light yellowish brown.

Male genitalia (Fig. 2a-d). 19-BAES-00198.

Uncus short, very thin, curved downward ventrally, with a moderate acute tip, dorsally a longitudinal groove, from base to near the apex, denticulate on margins from base to near the apex, on the basal portion a sclerotized broad and short structure arising dorsally and bearing a pair of lateral short distal projections, with a deer horns shape and covered by dense patches of strong bristles on dorsal surface, tegumen rounded in dorsal view, anterior margin of tegumen open "U"-shaped, valvae strongly sclerotized, broad basally and distally, constricted in the middle, with the basal half slightly lobulated on ventral margin, apex strongly truncate, costal margin slightly lobulate in the middle, strongly curved inward distally and with a pointed tip, internal surface convex at the middle, ventral margin with bristles from base to apex, transtilla strongly sclerotized, with two dorso-lateral elongated projections, rounded at the tip and fully covered by minute spines, anellus tubular-shaped, juxta slightly elongated and sclerotized, convex-shaped, saccus strongly elongated. Aedeagus elongated, slightly curved upward on the anterior end, vesica short, with two elongated lobes projecting ventrally, cornuti absent.

Adult female (Fig. 2g, h). 19-BAES-00279.

Similar to male. Forewing length 29.56-30.83 mm (n = 03).

Female genitalia (Fig. 14d). 19-BAES-00207.

Papilla analis semi-trapezoidal in lateral view, covered by short and long bristles, apophysis anterior smaller than apophysis posterior, lamella antevaginalis composed by a large, broad, sclerotized structure projected posteriorly, distally bilobulate, slightly narrowed at the middle, ostium bursae strongly sclerotized, placed basally on dorsal surface of lamella antevaginalis, a wide, rectangular, sclerotized and transversally striated postvaginal plate below papillae anales, ductus bursae elongated, strongly sclerotized, flattened dorso-ventrally, slightly narrowed on the middle portion, corpus bursae elongated, moderately large, basal portion reduced in size and with a striated surface, accessory bursae slightly smaller than corpus bursae, arising basally and to the left side, signum absent.

Remarks. – *P. ochracea* together with *P. annario* comprise the most complex group of cryptic species in *Pseudohemihyalea* present in Costa Rica, these two taxa share essentially the same phenotypic characters. In addition, intraspecific variation in both species make it more difficult to associate conspecific males and females. Thus, dissections of male and female genitalia are the most reliable way to confirm sexual association.

VI. ***Pseudohemihyalea annario*** (Dyar, 1914) **stat**. **rev**.

BIN BOLD:ACE8750

(Fig. 3a-d, 11e-h, 14e, 15b, d, e)

Material examined. – **19** ♂, **7** ♀.

COSTA RICA

- **1** ♂, INB0003325640. Prov. Limón, P. Int. La Amistad, Valle del Silencio, 2400 m, 16-18 ABR 2001, R. Delgado. Tp. de Luz, 9.1192547, -82.9643339, #63033;
- **1** ♂, INB0003545188. Prov. Cartago, P. N. Tapantí, Macizo de La Muerte, Estación La Esperanza, 2600 m, Oct 2002, R. Delgado, Tp. de Luz, 9.6912903, -83.8768319, #71751;
- **1** ♂, INB0003561664. Prov. Cartago, P. N. Tapantí, Macizo de La Muerte, Est. La Esperanza, 2600 m, DEC 2002, R. Delgado, De Luz, 9.6863242, -83.8813950, #72469;
- **1** ♂, INB0003554655. Prov. Cartago, EL Guarco, Macizo de la Muerte, Sector de la Esperanza, 2650 m, NOV 2002, R. Delgado, Trampa de Luz, 9.6867708, -83.8777497, #72178;
- **4** ♂, INB0004067345, INB0004067348, INB0004067369, INB0004067367. Prov. Limón, P. I. La Amistad Caribe, Camp. 1: Río Lori, Transecto 2, 1800-1900 m, 17 FEB 2007, B. Gamboa, M. Moraga, Tp. Luz, 9.3541667, -83.2344444, #90738;
- **1** ♂, INB0004121578. Prov. Cartago, R. F. Río Macho, Sector Villa Mills, Send. Robledales, 2762 m, 20-23 NOV 2007. B. Gamboa. M. Moraga, R González, Tp Luz, 9.5574769, -83.6866808, #92791;
- **4** ♂, 19-BAES-00205, 19-BAES-00206, 19-BAES-00208, 19-BAES-00278. Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, 2841 m, 29-30 de Agosto de 2019. Col. B. Espinoza, 9.5537777778, -83.6898611111;
- **1** ♀, INB0003545189. Prov. Cartago, P. N. Tapantí, Macizo de La Muerte, Estación La Esperanza, 2600 m, OCT 2002, R. Delgado, Tp. de Luz, 9.6912903, -83.8768319, #71751;
- **2** ♀, INB0004067341, INB0004067368. Prov. Limón, P. I. La Amistad Caribe, Camp. 1: Río Lori, Transecto 2. 1800-1900 m, 17 FEB 2007, B. Gamboa, M. Moraga, Tp. Luz, 9.3541667, -83.2344444, #90738;
- **1** ♀, 19-BAES-00108 (Dissected). Cartago, Macizo de la Muerte, P. Nac. Tapantí, Puente Río Humo, 1517 m, 30-31Julio-2019, Col. B. Espinoza. 9.703485 -83.782024, Manta #1;
- **1** ♀, 19-BAES-00229. Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, Camino del Portón a Bosque Robledal, 2841 m, 29-30 de Agosto de 2019, B. Espinoza, 9.557477, -83.686681. (Deposited MNCR).

COSTA RICA

- **6** ♂, Cartago, Villa Mills, 7-V-2010, 2840 m, M. Laguerre leg., one is dissected Gen. ML2013, two are sequenced: sequenced process ID ARCTC1006-11, BOLD ID MILA 1468 & sequenced process ID ARCTC1007-11, BOLD ID MILA 1469 (yellow printed label);
- **1** ♀, Cartago, P.N. Tapanti, 8-V-2010, 1632 m, M. Laguerre leg.;
- **1** ♀, Cartago, P.N. Tapanti, 9-V-2010, 1515 m, M. Laguerre leg., sequenced: sequenced process ID ARCTC997-11, BOLD ID MILA 1459 (yellow printed label). (Deposited MLC).

Diagnosis. – A complex species sharing the same adult patterns as those of *P. ochracea*, including polymorphism. On the other hand, *P. annario* is separated in the first instance by its DNA (1.71% of genetic divergence from *P. ochracea*), but also by the two lateral short processes on the basal part of uncus, deer horns-shaped, which have a different shape and different position if compared in dorsal view with those of *P. ochracea*. In *P. annario* these lateral structures have a strongly lobulated base, whereas this condition is absent in *P. ochracea*, the entire uncus

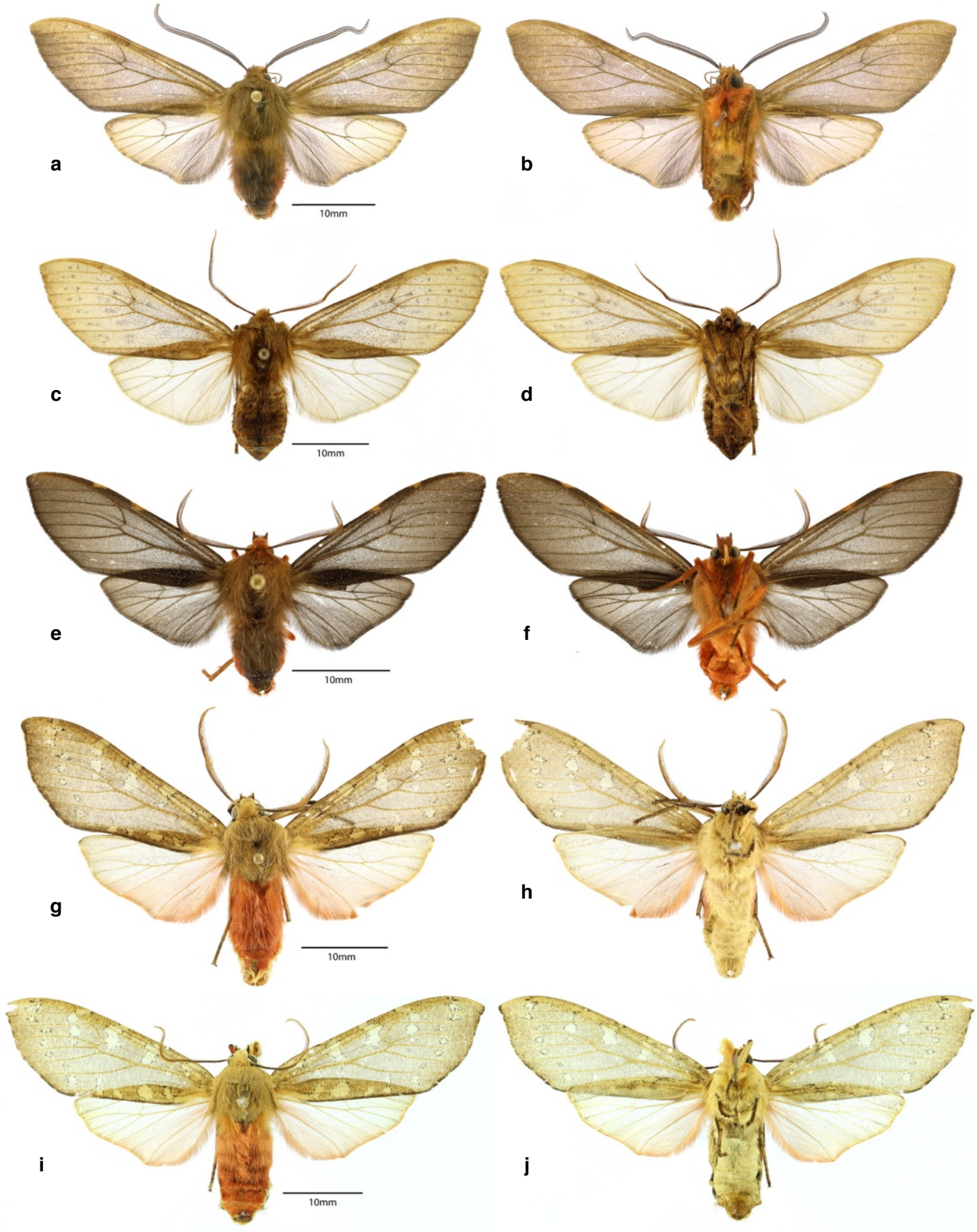

Figure 6. Adults of *Pseudohemihyalea*.

a, **b**. *P. despaignei despaignei* (Toulgoët, 1982), ♂, INB0003545185. **c**, **d**. *P. despaignei despaignei* (Toulgoët, 1982), ♀, INB0004313267. **e**, **f**. *P. despaignei melanorubra* Toulgoët, 1996, ♂, INBIOCRI000183077 (H-T). **g**, **h**. *P. toulgoëti* **sp. n.**, ♂, INBIOCRI001876032 (H-T). **i**, **j**. *P. toulgoëti* **sp. n.**, ♀, INBIOCRI000156632 (P-T).

base is wider in *P. annario*. Also, although the anterior margin of tegumen is open "U"-shaped in *P. annario*, it is much more pronounced in *P. ochracea*. The saccus is developed in *P. annario*, with a rounded shape, while it tempts to be V-shaped in *P. ochracea*. Valva in *P. annario* is strongly lobulated basally and with a basal protuberance, triangular-shaped and projecting inward, while it is straight basally in *P. ochracea*.

Description

Adult male (Fig. 3a, b). 19-BAES-00278.

Forewing length 26.62-30.99 mm (n = 13). This species basically shares the same adult morphology as that of *P. ochracea*, so to have a notion of its adult characteristics, see *P. ochracea* description.

Male genitalia (Fig. 11e-h). 19-BAES-00208.

Uncus short, very thin, strongly curved downward ventrally, with a moderate acute tip, dorsally with a longitudinal groove from base to near the apex, slightly denticulate on margins, on the basal portion a sclerotized broad and short structure arising dorsally, bearing a pair of anterior-lateral short projections, with a deer horns shape and covered basally by dense patches of short strong bristles, tegumen rounded in dorsal view, anterior margin of tegumen open "U"-shaped, valvae strongly sclerotized, broad basally and distally, constricted in the middle, with the basal half strongly lobulated on ventral margin, apex strongly truncate, very broad basally in ventral view, with a basal protuberance, triangular shaped and projecting inward, costal margin thin, with the tip strongly curved inward and acute, ventral margin covered by strong setae, internal surface with a short, robust protuberance. Transtilla strongly sclerotized, with two dorso-lateral elongated projections, slightly acute at the tip and fully covered by minute spines, anellus tubular-shaped, juxta slightly elongated and sclerotized, convex-shaped, saccus elongated. Aedeagus elongated, slightly curved upward on the anterior end, vesica short, with two lobes projecting ventrally, one elongated and the second one shorter and wider.

Adult female (Fig. 3c, d). 19-BAES-00207.

Similar to male. Forewing length 29.24-33.81 mm (n = 05).

Female genitalia (Fig. 14e). 19-BAES-00108.

Papilla analis trapezoidal in lateral view, covered by a mixture of short and long bristles, apophysis anterior smaller than apophysis posterior, lamella antevaginalis composed by a large, broad, sclerotized structure projecting posteriorly, distally bilobulate, very slightly narrowed at the middle, ostium bursae strongly sclerotized, placed basally on dorsal surface of lamella antevaginalis, a wide, rectangular, sclerotized and transversally striate postvaginal plate below papillae anales, ductus bursae elongated, strongly sclerotized, flattened dorso-ventrally, slightly narrowed on the middle portion, corpus bursae elongated, moderately small, thinner on the basal half and fully striate longitudinally, accessory bursae bigger than corpus bursae, rounded-shaped.

Remarks. – A synonymized species in Watson & Goodger 1986, and herein reestablished its status as a valid species after successful results on DNA sequencing processes and male and female genitalia structures examined. Given the difficulties to identify this species due to its phenotypic complexity shared with *P. ochracea*, one of the easiest ways to separate males is to focus on the basal portion of the valvae in ventral view, to verify the presence of the triangular inner projection on these structures, process that is diagnostic in *P. annario* and absent in *P. ochracea.*

VII. ***Pseudohemihyalea incerta*** Toulgoët, 1994. **Sp. redescribed**

BIN BOLD:ABY7370

(Fig. 3e-h, 10q-t, 14f)

Pseudohemihyalea incerta Toulgoët, 1994: 130.

Type locality. – Panama, [Chiriqui], Route Boquete, Baru.

Type specimen. – Holotype female (MNHN).

Material examined. – **23** ♂, **16** ♀.

COSTA RICA

- **2** ♂, INB0004067307 (Sequenced), INB0004067308 (Sequenced). (Dissected). Prov. Limón. P. I. La Amistad Caribe, Cap. 1: Río Lori, Transecto 2, 1800-1900 m, 17 FEB 2007, B. Gamboa, M. Moraga. Tp Luz, 9.3541667, -83.2344444, #90738;
- **1** ♂, INB0004067509. (Sequenced). (Dissected). Prov. Limón. P. I. La Amistad Caribe, Cap. 1: Río Lori, Transecto 1, 1800-1900 m, 16 FEB 2007, B. Gamboa, M. Moraga. Tp Luz, 9.3541667, -83.2344444. #90737;
- **1** ♂, INBIOCRI001375739. (Dissected). Prov. Puntarenas, Res. Biol. Monteverde, Est. La Casona, 1520 m, 01-31 MAR 1991. N. Obando. 10.2984286, -84.7925439;
- **1** ♂, INBIOCRI002238452. Prov. Puntarenas, Est. Pittier, 1670 m, 23 ENE-02 FEB 1995. E. Nuñez. 9.0256639, -82.9626953, #5401;
- **1** ♂, INBIOCRI002140384. Prov. Puntarenas, Est. Pittier, 1670 m, 23 ENE-02 FEB 1995. E. Alfaro. 9.0256639, -82.9626953, #4582;
- **1** ♂, INBIOCRI002337139. Prov. Puntarenas, Est. Pittier, 1670 m, 23-26 ENE 1995. S. Avila. 9.0256639, -82.9626953, #5862;
- **1** ♂, INBIOCRI001376026. Prov. Puntarenas, Res. Biol. Monteverde, Est. La Casona, 1520 m, N. Obando. 10.2984286, -84.7925439;
- **2** ♂, INB0003408761, INB0003903346. Prov. Heredia, El Angel waterfall, 8.2 km downhill Vara Blanca, 1350 m, 03 JAN 1981. D. H. Janzen & W. Hallwachs; 10.2602950, -84.1781519;
- **1** ♂, INBIOCRI002168866. Prov. Puntarenas, PILA – ACLA, Est. Pittier, 1670 m, 23 ENE – 02 FEB 1995. M. Moraga. 9.0256639, -82.9626953, #4619;
- **1** ♂, INB0003641762. Prov. Heredia, vicinity of N.P. Braulio Carrillo Rainforest E Finca Gurdian, Blacklight 30W. FG a (7). III 19.30-20.30h. 1710 m, 15.II.2004, Gunnar Brehm leg. 10.2066667, -84.115;
- **1** ♂, INB0003641717. Prov. Heredia, N. P. Braulio Carrillo rainforest E Vara Blanca and San Rafael, Blacllight 30W. SR b (10), III 20.30-21.30h., 2090 m, 25.iv.2003. Gunnar Brehm leg., 10.175, -84.11166666666666;
- **6** ♂, INB0004312762, INB0004312759, INB0004313126, INB0004313122, INB0004313068, INB0004312760. Prov. Alajuela, La Paz Waterfall Gardens, alrededores del hotel, 1480 m, 05-10 AGO 2007, B. Espinoza, Tp de Luz, 10.2042292, -84.1672261, #103638;
- **1** ♂, MNCR-A 05152394. CR, San José, Dota, Copey 2100msnm, 7-II – a 8-II-2002, G. Chaverri. Tp. Luz, 9.5275, -83.8863888888889, #000061710;
- **1** ♀, INBIOCRI002195209. Prov. Puntarenas, PILA-ACLA, Est. Pittier, 1670 m, 23 ENE - 2 FEB 1995. R. Villalobos, 9.0256639, -82.9626953. #4439;
- **1** ♀, INBIOCRI001756891. Prov. Puntarenas, San Luis, Monteverde. 1000-1350 m, 01-31 MAR 1994, Z. Fuentes, 10.2767228, -84.7966197, #2771;
- **1** ♀, INB0003408762. Prov. Heredia, EL Angel waterfall, 8.2 km downhill Vara Blanca, 1350 m, 03 JAN 1981, D. H. Janzen & W. Hallwachs, 10.2602950, -84.1781519;
- **1** ♀, INB000003450044. Prov. Cartago, 3 km S. Casa Mata, 16 km S San Isidro de Tejar, Interamericana, 1800 m, 04 DEC 1983. D. H. Janzen & W. Hallwachs, 9.7601433, -83.9815436;
- **1** ♀, INB0003640407. Prov. Heredia, P.N. Braulio Carrillo rainforest E Vara Blanca and San Rafael, Blacklight 30W, SR a (9), /18.30-19.30h, 2140 m, 24.IV. 2003, Gunnar Brehm leg., 10.175, -84.11166666666666;
- **1** ♀, INB0003520581. (Sequenced). (Dissected). Prov. Cartago, Paraíso, Pque Nal Tapantí, Sector La Represa, del Puente del Río Porras 300 m, SE, 1660m., 01-31 JUL 2002, R. Delgado, Tp de Luz, 9.6952139, -83.7811558, #70690;
- **1** ♀, INB0004072426. Prov. Limón, P. I. La Amistad Caribe, Camp. 2: Río Coen, orilla campamento, 1700-1800 m, 22 FEB 2007. B. Gamboa, M. Moraga. Tp. de Luz, 9.3830556, -83.2133333, #90731;
- **9** ♀, INB0004313119, INBI0004313120, INB0004313160, INB0004313121, INB0004313034, INB0004313159, INB0004313027, INB0004313161, INB0004312758. Prov. Alajuela, La Paz Waterfall Gardens, alrededores del hotel. 1480 m, 5-10 AGO 2007, B. Espinoza. Tp. de Luz, 10.2042292, -84.1672261, #103638. (Deposited MNCR).

COSTA RICA

- **1** ♂, Puntarenas, around Guacimal, 23-IX-2009, 335 m, D. Herbin leg., dissected Gen. ML1936, sequenced: sequenced process ID ARCTD547-12, BOLD ID MILA 1672 (yellow printed label);
- **1** ♂, Puntarenas, P.N. Monteverde, 22-IX-2009, 1532 m, D. Herbin leg., dissected Gen. ML1935.
- **1** ♂, Heredia, VIII-1986, dissected Gen. ML2003. (Deposited MLC).

Diagnosis. – A species related to *P. variabilis* Toulgoët, 1994, described from Mexico, Oaxaca, due to the morphological characteristics shared by both species, but *P. incerta* can be recognized by having the tip of the valva almost truncate, while in the male of *P. variabilis* the valva is pointed at the tip. Also, in the female of *P. incerta* the lamella antevaginalis differs in shape, being widely expanded laterally, while in the female of *P. variabilis* this structure is much more reduced.

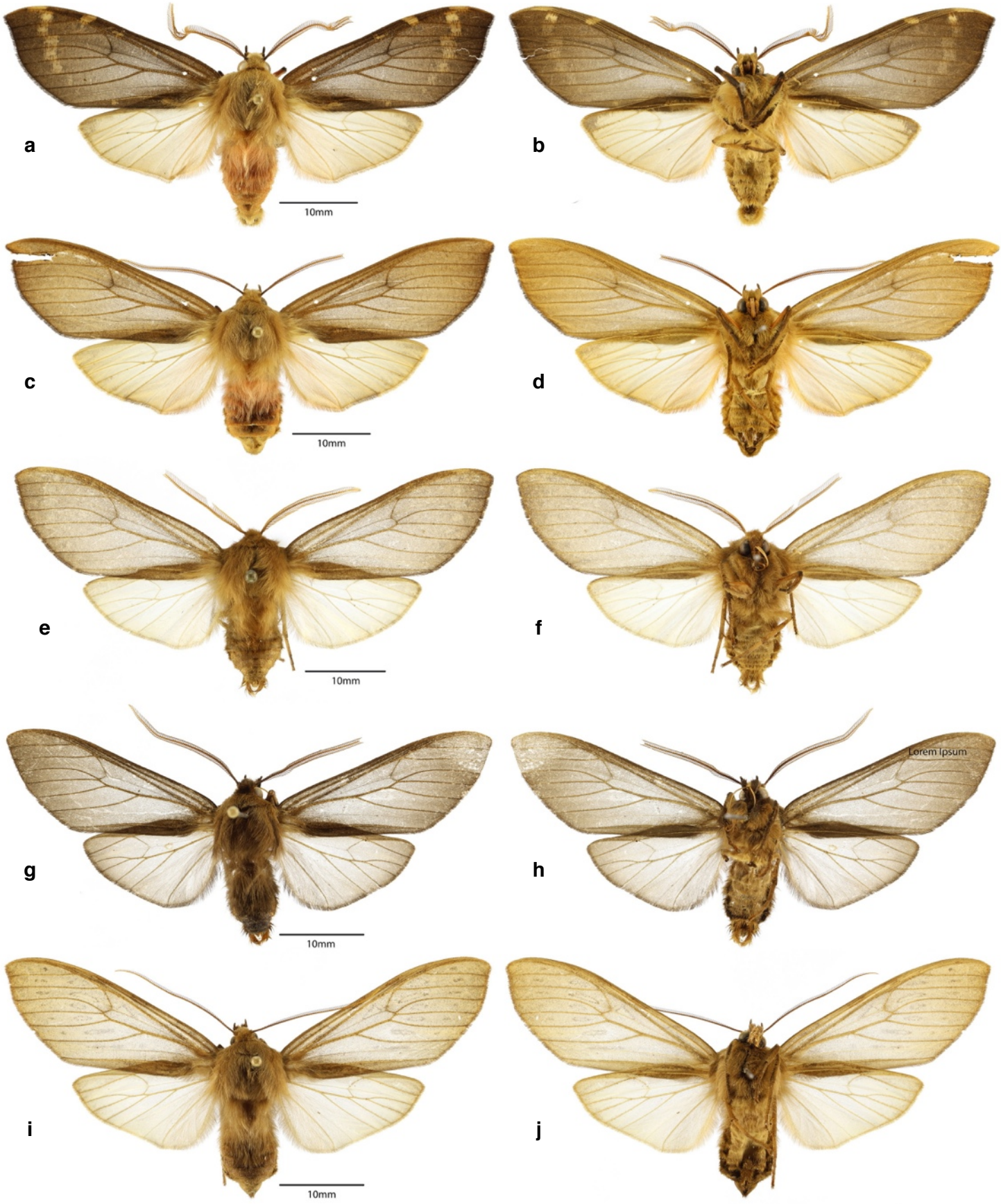

Figure 7. Adults of *Pseudohemihyalea*.

a, **b**. *P. rexhamiltoni* **sp**. **n**., ♂, 11-SRNP-101054 (H-T). **c**, **d**. *P. rexhamiltoni* **sp**. **n**., ♀, 11-SRNP-101060 (P-T). **e**, **f**. *P. bosullivani* **sp**. **n**., ♂, INB0004313461 (H-T). **g**, **h**. *P. montywoodi* **sp**. **n**., ♂, INB0003487069 (H-T). **i**, **j**. *P. montywoodi* **sp**. **n**., ♀, INB0003554659 (P-T).

Description

Adult male (Fig. 3e, f). INB0004312762.

Forewing length 24.89-28.27 mm (n = 20). Head and thorax light yellowish brown. Palpus moderately long, not reaching vertex of head, dark brown laterally, antenna bipectinate, brown color, barely exceeding half the length of the wing, scape, pedicel and first flagellomeres yellowish cream. Legs light yellowish cream, anterior leg with femur orange and a dark brown spot distally, tibia with an orange stripe, tarsi brown, middle leg with brown tarsi, posterior leg with orange on internal surface of femur and tibia. Forewing light yellowish brown background color, with two transversal series of irregular light yellowish patches partially edged with black on postmedial and subterminal areas, outer margin very slightly darker apically. Hindwing semihyaline, with a slightly light yellowish orange background tone, anal area with a light orange pink hue, outer margin light orange. Abdomen with tergites 1 to 5 very hairy, pink color, tergites 6 to 8 pink orange, ventrally pale yellowish cream. Female with uniform maculation on forewing and the apical margins very slightly darker.

Male genitalia (Fig. 10q-t). INBIOCRI001375739.

Uncus composed by a large basal sclerotized concave structure, circular shaped and with two anterior projections, elongated, flattened, slightly curved posteriorly and with a rounded tip, medially a strongly sclerotized structure, broad, strongly curved and flattened that is bifurcate at the tip, with two lateral projections, thin and acute shape, distal portion of uncus short, sclerotized, very slightly bulbous before end and with a pointed tip. Anterior margin of tegumen V-shaped. Valva very broad basally, constricted on the medial portion, costal margin with a medial triangular projection, distal portion with a broad flattened projection, strongly sclerotized, slightly concave and sharpened-edged arising on interior surface, ventral margin with long bristles on the distal half, apex of valva wide, almost truncate shape and slightly curved inward. Transtilla sclerotized, with two elongated lobes, dorsal surface partially sclerotized basally, membranous distally and completely covered by large and thick spines, fully membranous ventrally. Juxta slightly sclerotized, slightly convex and composed by two triangular plates. Aedeagus with the anterior half wider than posterior half, vesica short, with one large elongated lobe arising to the right, a second shorter and thicker lobe arising dorsally, with minute spines on the tip and a third small lobe arising basally on dorsal surface, which bent downward ventrally.

Adult female (Fig. 3g, h). INB0004313120.

Similar to male, but with uniform maculation on forewings. Forewing length 24.57-29.63 mm (n = 05).

Female genitalia (Fig. 14f). INB0003520581.

Papilla analis almost square in lateral view, with the posterior margin rounded, apophysis posterior two times the length of apophysis anterior, lamella antevaginalis broad, membranous, with long bristles on margin, lamella postvaginalis very slightly sclerotized, broad, not well defined in shape, ostium bursae sclerotized, ductus bursae very short, sclerotized, strongly concave in ventral view, corpus bursae elongated, lobulated, very slightly striated longitudinally. Accessory bursae broad, arising dorsally on the basal portion of corpus bursae.

Remarks. – *P. incerta* was described from a female from Panama, [Chiriqui], Route Boquete, Baru, which is near the border with Costa Rica and it makes congruent the presence of this species in the area of CR. On the other hand, males of *P.* "*variabilis*", a species described from Mexico, Oaxaca, [Route Tuxtepec à Oaxaca PK 86] were identified for CR by Hervé de Toulgoet in the middle 1990s, but the recently achieved genetic sequences of this material link the specimens to *P. incerta* and so the presence of *P. variabilis* down here in CR is totally discarded.

VIII. ***Pseudohemihyalea anapheoides*** (Rothschild, 1909)
BIN BOLD:ACE8749 (in part)
(Fig. 4a-d, 11i-l, 14g)

Halisidota anapheoides Rothschild, 1909: 223.

Type locality. – [Panama], [Chiriqui], Volcano de Chiriqui.

Type specimen. – Holotype female (BMNH).

Material examined. – **12** ♂, **17** ♀.

COSTA RICA

- **1** ♂, INB0003366224 (Sequenced). Prov. Cartago, Paraiso, P. N. Tapantí, 10-12 SEP 1999. B. Espinoza. Red de Golpe. 9.7363503, -83.7806278, #64500;
- **2** ♂, INB0004067995 (Sequenced), INB0004067977 (Sequenced). Prov. Limón, P. I. La Amistad Caribe, Camp. 3: Fila Bugu, orilla campamento, 1500-1600 m, 25-26 FEB 2007, B. Gamboa, M. Moraga. Tp. Luz, 9.4313889, -83.1997222, #90732;
- **1** ♂, INB0004067500 (Sequenced), (Dissected). Prov. Limón, P. I. La Amistad Caribe, Camp. 1: Río Lori, Transecto 1, 1800-1900 m, 16 FEB 2007, M. Moraga, B. Gamboa. Tp. Luz, 9.3541667, -83.2344444, #90737;
- **1** ♂, INB0003793025. Cartago, Tapantí, Río Grande de Orosi, 1300-1400 m, 8-9 JUL 1986, I. and A. Chacón. 9.7705556, -83.7752778;
- **1** ♂, INB0004389648. Prov. Cartago, Paraiso, Orosi, P. Nal. Tapantí, 1633 m, 11 Sept. 2009, K. Wolfe & D. Herbin. 9.6927778, -83.7666667;
- **1** ♂, INBIOCRI001964093. Prov. Cartago, A. C. Amistad, P. N. Tapantí, Río Dos Amigos, 1400-1700 m, 01-31 Mar 1994, G. Mora, A. Solis, E. Ulate, 9.7218917, -83.7847539, #2782;
- **1** ♀, INB0003058433 (Sequenced). Prov. Cartago, Paraíso, Pque Nal Tapantí, Sect La Represa, del Puente del R. Porras 300m S., 1660 m, 01-29 FEB 2000, L. Chavarría, de Luz, 9.6952139, -83.7811558, #54590;
- **2** ♀, INB0004067455 (Sequenced), (Dissected), INB0004067507 (Sequenced). Prov. Limón, P. I. La Amistad Caribe, Camp. 1: Río Lori, Transecto 1, 1800-1900 m, 16 FEB 2007, M. Moraga, B. Gamboa. Tp. Luz, 9.3541667, -83.2344444, #90737;
- **1** ♀, INB0004072499 (Sequenced). Prov. Limón, P. I. La Amistad Caribe, Camp. 2: Río Coen, orilla campamento, 1700-1800 m, 22 FEB2007, B. Gamboa, M. Moraga, Tp. Luz, 9.3830556, -83.2133333, #90731;
- **2** ♀, INB0003793030, INB0003793029. Prov. Cartago, Tapantí, Río Grande de Orosi, 1300-1400 m, 8-9 JUL 1986, I. and A. Chacón, 9.7705556, -83.7752778;
- **1** ♀, MNCR-A 05152395. CR, San José, Dota, Copey, 2100 msnm, 07-II a 08-II-2002, G. Chaverri. Tr. Luz, 9.5275764, -83.8864847, #000061710. (Deposited MNCR).

COSTA RICA

- **3** ♂, **7** ♀, Cartago, P.N. Tapanti, 9-V-2010, 1515 m, M. Laguerre leg.,
- **1** ♂ is dissected Gen. ML2362,
- **1** ♀ is sequenced: sequenced process ID ARCTD707-12, BOLD ID MILA 1832 (yellow printed label);
- **1** ♀, Cartago, P.N. Tapanti, 11-IX-2009, 1632 m, D. Herbin leg.;
- **1** ♂, **1** ♀, Cartago, P.N. Tapanti, 8-V-2010, 1632 m, M. Laguerre leg. (Deposited MLC).

Diagnosis. – This is the only species of the *Pseudohemihyalea* group in CR, easy to separate by its strongly highlighted venation, contrasting with the pale yellowish background color of forewings. None of the other species in the country have such a distinctive adult maculation.

Description

Adult male (Fig. 4a, b). INB0004067995.

For adult description, see Rothschild, 1909. Forewing length 24.34-26.06 mm (n = 07).

Male genitalia (Fig. 11i-l). INB0004067500.

Uncus sclerotized, basal portion projecting dorsally, concave-shaped and divided in two wide and flattened processes, with a pointed tip, distal portion slightly elongated, wide in lateral view, slightly curved, with a pointed tip. Anterior margin of tegumen "open V-shaped". Valva sclerotized, elongated, costal margin straight in lateral view, slightly curved inward in dorsal view, with a pointed tip, ventral margin with the basal half slightly rounded, distal half covered by moderately long bristles and with a pointed and curved inward tip. Transtilla strongly sclerotized, projecting posteriorly over the aedeagus and covered by minute thick spines on it distally. Juxta sclerotized, convex, wider in the inferior part with a rounded shape and very thin in the superior part. Saccus extended, U-shaped. Aedeagus elongated, thin and slightly curved to the left in dorsal view, vesica thin, elongated, with the distal portion curved downward ventrally, with a basal long lobe arising laterally to the left in dorsal view and with a pointed tip.

Adult female (Fig. 4c, d). INB0003793030.

No sexual dimorphism is present. Forewing length 25.17-27.05 mm (n = 07).

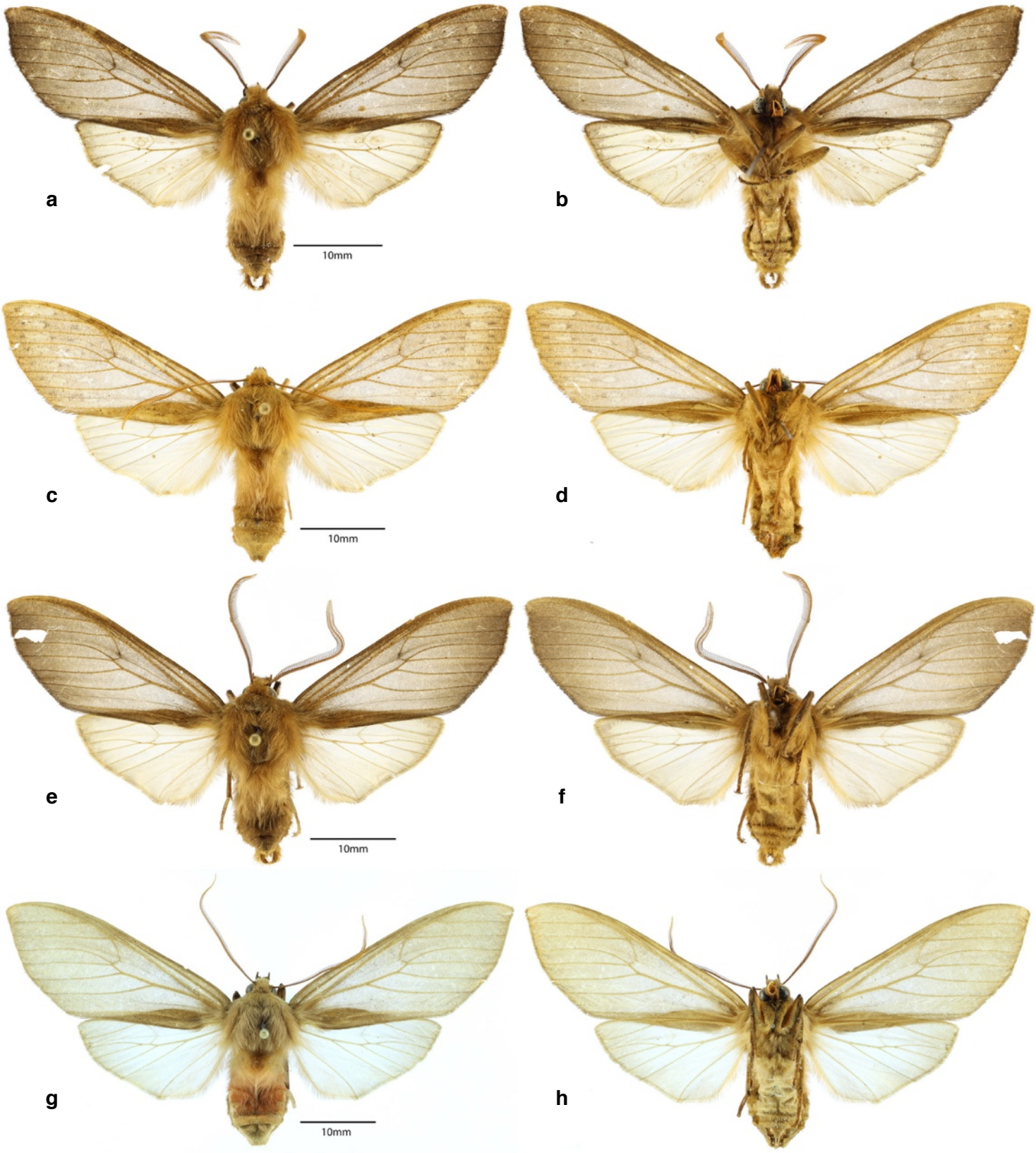

Figure 8. Adults of *Pseudohemihyalea*.

a, **b**. *P. eugeniephillipsae* **sp**. **n**., ♂, INB0003430883 (H-T). **c**, **d**. *P. eugeniephillipsae* **sp**. **n**., ♀, INBIOCRI000225857 (P-T). **e**, **f**. *P. marcepsteini* **sp**. **n**., ♂, INB0003430882 (H-T). **g**, **h**. *P. corralesi* Toulgoët, 1996, ♀, INB0003409214.

Female genitalia (Fig. 14g). INB0004067455.

Papilla analis almost square-shaped in lateral view, covered with long setae, a large and distinctive dorsal patch of short bristles, apophysis posterior the same size as apophysis anterior, lamella antevaginalis wide, sclerotized, with two short distal projections, flattened dorsoventrally. Lamella postvaginalis slightly sclerotized, with a longitudinal thin striation in the middle, which extends laterally in the distal portion. Ostium bursae sclerotized, ductus bursae elongated, flattened dorsoventrally, corpus bursae elongated, lobulate shape, longitudinally striated, with the basal half thinner than distal half, accessory bursae large, striated.

Remarks. – *Pseudohemihyalea anapheoides* is one of the members of a six-species group sharing the same genetic sequence (BIN BOLD:ACE8749), condition that is found in other complexes of Arctiinae' species, but that in *Pseudohemihyalea* make it more difficult to separate them considering the intraspecific variation present in several species of this genus. In the case of *P. anapheoides*, despite its genetic complexity, this species is phenotypically very distinctive and so this completely simplifies its separation from others species of *Pseudohemihyalea*.

IX. ***Pseudohemihyalea celsicola*** (Toulgoët, 1982)

BIN BOLD:ACE8749 (in part)

(Fig. 4e-h, 11m-p, 14h)

Hemihyalea celsicola Toulgoët, 1982: 21.

Type locality. – Costa Rica, [Cartago], Cerro de la Muerte.

Type specimen. – Holotype male (MNHN).

Material examined. – **27** ♂, **11** ♀.

COSTA RICA

- **1** ♂, INB0003769584 (Sequenced), (Dissected). Prov. Puntarenas, R. I. Ujarrás – Salitre – Cabagra, Buenos Aires, Cerro Aká, 3179 m, 20 SEP 2003, M. Alfaro, Tp de Luz, 9.3798533, -83.3119772, #75464;
- **12** ♂, INB0004313585, INB0004313582, INB0004313577, INB0004313579, INB0004313594, INB0004313576, INB0004313483, INB0004313371, INB0004313377, INB0004313490, INB0004313419, INB0004313580. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, km 92, Finca Los Nímbolos, 3300 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5617972, -83.74091944444444, #103640;
- **3** ♂, INB0003521458, INB0003521461, INB0003521451. Prov. San José, Z. P. Caraigres, Cerro Caraigres, bosque primario en Fila El Alto, cerca de la gruta, 2200 m, 24 JUL 1997, B. Espinoza, Libre. 9.7138889, -84.1116667, #70499;
- **2** ♂, INB0003512015, INB0003512014. Prov. Cartago, 1 km NE Cerro Asunción, Cerro de la Muerte, 3100 m, 08 APR 1984. D. H. Janzen & W. Hallwachs, 9.5778897, -83.7532025;
- **1** ♂, INBIOCRI002603466. Prov. Cartago, Reserva Río Macho, Est. Ojo de Agua, 2960 m, 24-26 FEB 1998, E. Alfaro, Tp Luz, 9.6176519, -83.8169825, #49903;
- **1** ♂, INBIOCRI002551620. Prov. San José, R. F. Río Macho. Estación Ojo de Agua, Cerca de la Estación, 3000 m, 5-9 ABR 1997, B. Gamboa, de Luz, 9.6194547, -83.8301928, #46297;
- **2** ♂, INB0004313256, INB0004313252. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, altura km 95, 1 km antes de la Georgina (Casa del Sr. Hilario), 3200 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5625278, -83.7331603, #103639;
- **6** ♀, INB0004313573, INB0004313484, INB0004313451, INB0004313591, INB0004313608, INB0004313366. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, km 92, Finca Los Nímbolos, 3300 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5617972, -83.74091944444444, #103640;
- **2** ♀, INB0003511977, INB0003511978. Prov. Cartago, 1 km NE Cerro Asunción, Cerro de la Muerte, 3100 m, 02 March 1985, D. H. Janzen & W. Hallwachs, 9.5778897, -83.7532025;
- **1** ♀, INB0003521462 (Dissected). Prov. San José, Z. P. Caraigres, Cerro Caraigres, bosque primario en Fila El Alto, cerca de la gruta, 2200 m, 24 JUL 1997, B. Espinoza, Libre, 9.7138889, -84.1116667, #70499;
- **1** ♀, INB0003429013. Prov. Cartago, 1 km NE Cerro Asunción, Cerro de la Muerte, 3100 m, 02 March 1985, D. H. Janzen & W. Hallwachs, 9.5778897, -83.7532025.
- **1** ♀, INB0004313253. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, altura km 95, 1 km antes de la Georgina (Casa del Sr. Hilario), 3200 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5625278, -83.7331603, #103639 (Deposited MNCR).

COSTA RICA

- **5** ♂, San José, Paramo Cerro de la Muerte, 4-V-2010, 3209 m, D. Herbin leg., two males are dissected: Gen ML2368 & 3854, three males are sequenced : sequenced process ID ARCTC1008-11, BOLD ID MILA 1470, sequenced process ID ARCTC1009-11, BOLD ID MILA 1471, sequenced process ID ARCTD017-11, BOLD ID MILA 1522 (yellow printed labels). (Deposited MLC).

Diagnosis. – *P. celsicola* can be distinguished from the other species present in Costa Rica by having the forewing uniformly speckled with minute black points on a pale yellowish-brown background color. Also, this species can be separated by its adult size, being slightly bigger and more robust than others of its congeneric species, as well as by the shape of the uncus, which is also robust and very ornamented on the basal half, with two short processes, pointed at the tip, arising laterally, strongly curved downward and horn-shaped. Only *P. corralesi* females can be compared to *P. celsicola* by their size and robustness, but *P. corralesi* is lighter and with a uniform maculation on FW.

Description

Adult male (Fig. 4e, f). INB0004313252.

See Toulgoët 1982, for original description. Forewing length 27.55-29.86 mm (n = 22).

Male genitalia (Fig. 11m-p). INB0003769584.

Uncus strongly sclerotized, very broad basally, divided into two short and wide processes, projecting dorsally, with a pointed tip, arising laterally, strongly curved downward and horn-shaped; distal half short and pointed at the tip. Anterior margin of tegumen concave. Valva broad, ventral margin covered by long bristles and slightly lobulate in the basal half, costal margin covered with long bristles, except basally and with a small constriction near the middle portion in dorsal view, the tip ending into two short pointed processes, the ventral one slightly larger and slightly curved inward. Transtilla strongly sclerotized, with a patch of short and thick spines in the central portion. Juxta sclerotized, not well defined in shape, slightly convex in the basal portion and covered by minute and thick spines in the distal portion. Saccus elongated, V-shaped. Aedeagus elongated, thin, vesica short, with two large elongated lobes, one straight projecting posteriorly to the right and the second one arising dorsally, strongly curved and projecting anteriorly, a third very short lobe arising dorso-laterally to the left on the basal portion.

Adult female (Fig. 4g, h). INB0004313253.

See Toulgoët 1982, for original description. Forewing length 29.15-30.74 mm (n = 10).

Female genitalia (Fig. 14h). INB0003521462.

Papilla analis with the posterior margin semicircular, covered with short and long bristles, a dense dorsal patch of very short bristles on dorsal portion, apophysis posterior longer than apophysis anterior, lamella antevaginalis strongly sclerotized, composed by a prominent structure, bilobulate, with lobes slightly projected laterally, lamella postvaginalis sclerotized, very wide, expanded laterally, ostium bursae sclerotized, oval opening, ductus bursae very long, sclerotized, flattened dorsoventrally, with the distal portion bent in opposite direction, corpus bursae nut-shaped, striated longitudinally, basal portion thin.

Remarks. – *P. celsicola* is also a member of the six-species group sharing the same genetic sequence (BIN BOLD:ACE8749). The phenotype of this species was very well characterized by Hervé de Toulgoët in the original description. Here we limit ourselves to providing a male and female genitalia description due to its relevance for better characterizing this species at this level, considering the complexity of these structures and the confusion with the drawing provided by Toulgoët, which is limited to illustrating only a few

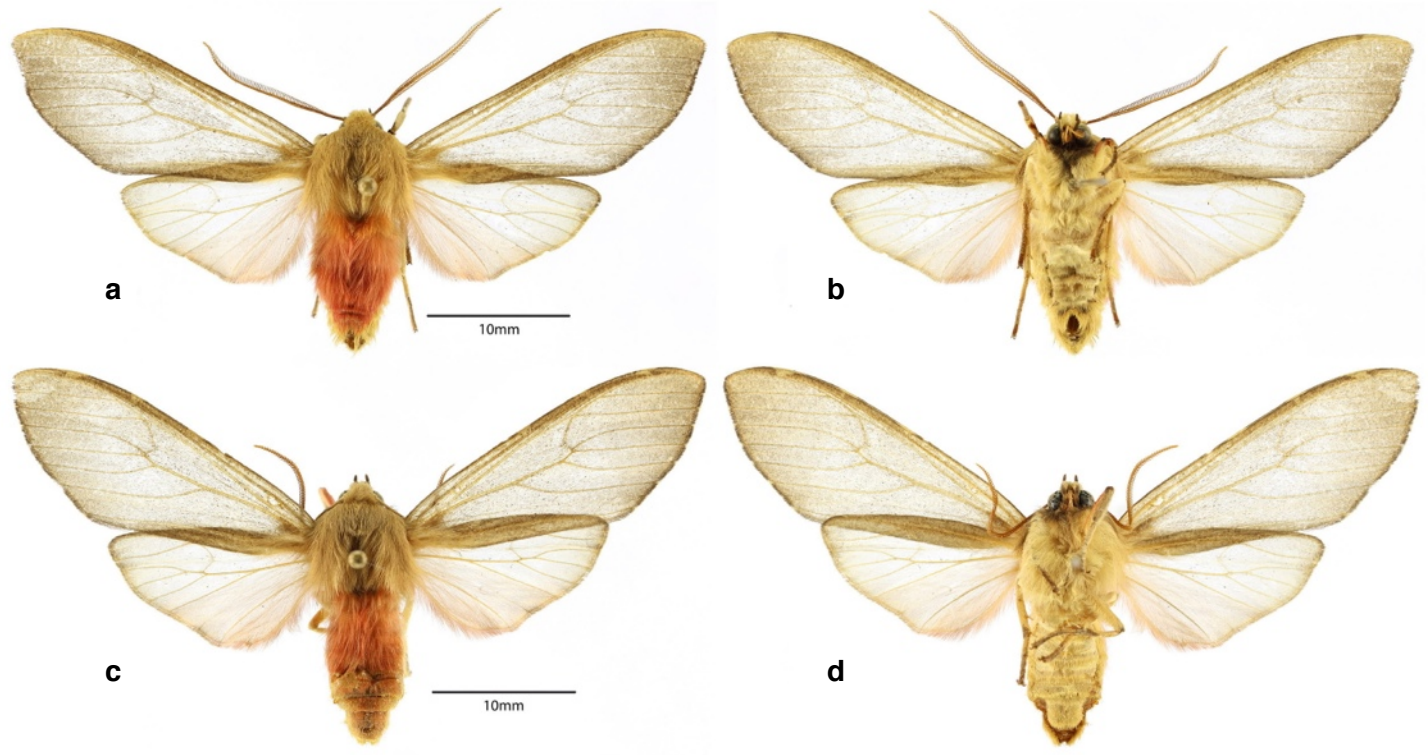

Figure 9. Adults of *Pseudohemihyalea*.

a, **b**. *P. fuscescens* (Rotschild, 1909), ♂, INBIOCRI000169363. **c**, **d**. *P. fuscescens* (Rotschild, 1909), ♀, INBIOCRI000697600.

aspects of the male genitalia, but not the whole structure, which is more complex for the entire genitalia capsule.

X. ***Pseudohemihyalea schausi*** (Rothschild, 1935)
BIN BOLD:ABX5872
(Fig. 5a-d, 11q-t, 14i, 16 l-n)

Hemihyalea schausi Rothschild, 1935: 245.

Type locality. – Costa Rica, [Cartago], Juan Viñas.

Type specimens. – Described from 2 male and 2 female syntypes (BMNH; one male syntype labeled TYPE).

Material examined. – **20** ♂, **15** ♀.

COSTA RICA

- **1** ♂, INB0003935097. (Sequenced). (Dissected). Prov. Cartago, pejibaye, Reserva Biol. Copal, 1040 m, 03-07 ABR 2005, J. Azofeifa, B. Gamboa, D. Briceño, M. Moraga, J. Gutiérrez, Y. Cárdenas, Tp. Luz, 9.7834072, -83.7519294, #80025;
- **1** ♂, INB0004188199. (Sequenced). Prov. Alajuela, San Ramón, Est. Biol. Villa Blanca, 1115 m, 25-29 NOV 2008, R. Rojas, Tp. Luz Mercurio, 10.2013611, -84.4851006, #95460;
- **1** ♂, INBIOCRI001080896. Prov. Puntarenas, Coto Brus, Las Brumas, 1400 m, 02 DEC 1980, L. D. Gomez, 8.7396611, -82.98733055555556;
- **1** ♂, INB0003454905. Prov. Cartago, Moravia de Chirripo, 1000 m, 10 MAY1983, D. H. Janzen & W. Hallwachs, 9.8287089, -83.4427261;
- **1** ♂, INB0004297711. Prov. Heredia, Santa Bárbara, Finca La Kandela, 1400-1500 m, 26 SEP 2011, B. Espinoza, Tp. de Luz, 10.0794497, -84.1590817, #102887;
- **1** ♂, INB0003456416. Prov. Puntarenas, Monteverde, 1400 m, 10-11 DEC 1979, D. H. Janzen & W. Hallwachs, 10.3051869, -84.8080742;
- **1** ♂, INB0003506308. Prov. Cartago, Tapantí, Río Grande de Orosi, 1300-1400 m, 23 JAN 1985, D. H. Janzen & W. Hallwachs, 9.7705556, -83.7752778;
- **1** ♂, INB0003506914. Prov. San José, Par. Nac. Braulio Carrillo, Estación Zurquí (el Tunel), 1500 m, 01-31 JAN 1986, I y A. Chacón, 10.0677778, -84.0025000;
- **1** ♂, INBIOCRI001080799. Prov. Puntarenas, P. N. Amistad, Fca. Cafrosa, Est. Las Mellizas, 1300 m, 01-30 April 1989, M. Ramirez & G. Mora, 8.9034167, -82.7887528;
- **1** ♂, INBIOCRI000697599. Prov. San José, S. Gerardo, Dota, Fca. Zacatales, 2300 m, 22 FEB 1992, J. F. Corrales, 9.5335644, -83.8192244;
- **1** ♂, INB0004312775. Costa Rica, Prov. Alajuela, La Paz Waterfall Gardens, alrededores del hotel, 1480 m, 05-10 AGO 2007, B. Espinoza, Tp. de Luz, 10.2042292, -84.1672261, #103638;
- **1** ♂, INB0004313392. Prov. Cartago, Paraíso, R. F. Río Macho. Carretera Interamericana, km 92, Finca Los Nímbolos, 3300 m, 24-27 JUL 2007, B. Espinoza, Tp de Luz, 9.5617972, -83.74091944444444, #103640;
- **1** ♀, INB0004208520 (Sequenced), (Dissected). Prov. Alajuela, San Ramón, Est. Biol. Villa Blanca, 1115 m, 30 SEP – 02 OCT 2008, R. Rojas, Tp. Luz Mercurio, 10.2013611, -84.4851006, #95351;
- **1** ♀, INB0004162175 (Sequenced). Prov. Alajuela, San Ramón, Est. Biol. Villa Blanca, 1115 m, 19 JUN 2008, J. Montero, R. Rojas, Tp. Luz Mercurio, 10.2013611, -84.4851006, #94094;
- **1** ♀, INB0004051366 (Sequenced). Prov. Limón, R. B. Hitoy Cerere, Cerro Bitarkara, bosque secundario, 1000-1100 m, 23 NOV 2006, M. Moraga, B. Gamboa. Tp. Luz, 9.6402778, -83.1375000, #90238;
- **1** ♀, INBIOCRI001080804. Prov. Puntarenas, P. N. Amistad, Fca. Cafrosa, Est. Las Mellizas, 1300 m, 20 AUG – 04 SET 1989, M. Ramirez & G. Mora, 8.8901, -82.7910;
- **1** ♀, INBIOCRI000809773. Prov. Cartago, Turrialba, Chirripo, Grano de Oro, 1120 m, 01-31 OCT 1992, P. Campos, 9.8183569, -83.4591633;
- **1** ♀, INBIOCRI002477362. Prov. Puntarenas, Estación Altamira, 1 km S del Cerro Biolley, 1300-1400 m, 12-30 AGO 1996, R. Villalobos, de Luz, 9.0329867, -83.0108869, #8287;
- **1** ♀, INB0003455040. Prov. Alajuela, El Angel waterfall, 8.2 km downhill Vara Blanca, 1350 m, 22 APR 1984, D. H. Janzen & W. Hallwachs, 10.2602950, -84.1781519;
- **1** ♀, INB0004239270. Prov. Alajuela, San Ramón, Est. Biol. Villa Blanca, 1115 m, 20-22 JUL 2009, R. Rojas, Tp. Luz Mercurio, 10.2013611, -84.4851006, #97635;
- **1** ♀, INB0004313026. Prov. Alajuela, La Paz Waterfall Gardens, alrededores del hotel, 1480 m, 05-10 AGO 2007, B. Espinoza, Tp. de Luz, 10.2042292, -84.1672261, #103638. (Deposited MNCR).

COSTA RICA

- **1** ♂, Guanacaste, Nicoya, VIII-1986, dissected Gen. ML242;
- **1** ♀, Alajuela, Rio Shiriqui, X-1986;
- **1** ♂, Cartago, P.N. Tapanti, 9-V-2010, 1515 m, M. Laguerre leg., dissected Gen. ML3852;
- **1** ♀, San José, Cerro de la Muerte, 4-V-2010, 2722 m, M. Laguerre leg.;

- **1** ♂, Cartago, Villa Mills, 7-V-2010, 2840 m, M. Laguerre leg. (Deposited MLC).

NICARAGUA

- **2** ♂, **3** ♀, Jinotega, El Jaguar, 21.23-V-2006, 1346 m, JM Maes leg., **2** ♂ are dissected Gen. ML 1796 & 3914, **1** ♂ is sequenced: sequenced process ID ARCTA749-07, BOLD ID MILA 0468 (yellow printed label). (Deposited MLC).

Diagnosis. – *P. schausi* is easy to recognize by having the forewing with a uniform maculation on a pale yellowish-brown background color, combined with the semihyaline characteristic present almost all over the wing, except on the outer margin, which is slightly darker and with black cilia, as well as the palpus dark brown on outer surface of basal and middle segments and the distal segment totally dark brown. This species can be morphologically confused with *P. incerta* due to the similarities they share, but on male and female genitalia they are very different. Male of *P. incerta* has longer processes on the basal half of uncus, while in *P. schausi*, these processes of the basal half of uncus are shorter and more robust. Female genitalia of these two species are completely different from each other, specifically on the shape of lamella antevaginalis and on the shape of corpus bursae, these structures being simpler in *P. incerta* and more ornamented in *P. schausi*.

Description

Adult male (Fig. 5a, b). INB0004313029.

See Rothschild 1935 for original description. Forewing length 24.38-27.53 mm (n = 12).

Male genitalia (Fig. 11q-t). INB0004188199.

Uncus strongly ornamented on the basal half, with a large concave structure, cup-shaped, opened on the anterior end, which extend forming two elongated processes projecting posteriorly and slightly curved downward ventrally, anterior margin constricted in the middle, slightly concave and with two thin and short processes slightly curved and projected posteriorly. Distal half of uncus short, thick, longitudinally concave on dorsum and pointed at the tip. Anterior margin of tegumen deeply V-shaped. Valva sclerotized, broad, rigid, with the ventral margin constricted in the middle; costal margin constricted medially in dorsal view and with the distal half wider, apex of valva truncate, strongly sclerotized, with an irregular denticulate surface. Transtilla strongly sclerotized, with two structures, projecting posteriorly and dorsally conformed by short spines basally and large spines distally, one of which is notoriously bigger than the other ones at the tip, ventral side of these structures with a whitish membrane. Juxta slightly convex, sclerotized and composed by two elongated plates. Aedeagus slightly elongated, sclerotized, thick, anterior half notoriously thicker than posterior half, coecum penis lobulate and projecting ventrally, vesica elongated, with two short lobes arising dorsally on the basal portion, rounded tip, one projecting anteriorly, a third thick lobe projecting posteriorly and with a patch of tiny spines on the distal portion, a fourth large elongated lobe distally with a pointed tip.

Adult female (Fig. 5c, d). INB0004239270.

See Rothschild 1935, for original description. Forewing length 26.69-28.67 mm (n = 09).

Female genitalia (Fig. 14i). INB0004208520.

Papilla analis square-shaped, apophysis posterior almost two times the length of apophysis anterior, lamella antevaginalis prominent, strongly sclerotized, rectangular shaped, with the posterior margin irregular, sinuous-like and covered by elongated bristles, lamella postvaginalis sclerotized and composed by a large irregular plate expanded laterally, ostium bursae sclerotized, elongated-shaped, ductus bursae very short, sclerotized, flattened dorso-ventrally, corpus bursae, elongated, rolled up-shaped basally, medial portion straight, distal portion bean-shaped, striate longitudinally, accessory bursae bigger than corpus bursae, peanut-shaped and striate.

Remarks. – Females of *P. schausi* can be easily confused with those of *P. incerta* because, in both species, females share the same maculation patterns, except for the dorsal coloration of the abdomen, which is less intense in *P. incerta* and has a yellowish-brown tail, although sometimes it is not easy to perceive this in poorly preserved specimens. Additionally, checking the sterigma in females of both species is the best way to confirm their identification, with a prominent and exposed rectangular structure in *P. schausi*, that is easy to check under the scope and does not require dissecting the specimen. In *P. incerta*, on the other hand, this structure is not prominent and needs to be cleaned to see its shape. Related to the male of *P. schausi*, this species has strongly ornamented genitalia. The valvae are very robust with truncate tips. The basal portion of the uncus is composed of a large structure with very distinctive, elongated, curved projections arising postero-dorsally, which make this species unmistakable from other congeneric species. Images available of the male syntype specimen, No. 4410 (Figs 16 l, m, n), showing the genitalia capsule and phallus (NHMUK), were examined to verify the identification of *P. schausi*. We found no differences from the male series studied in this work, so *P. schausi* is confirmed here. The conspecific association of male and female of *P. schausi* was verified through DNA barcoding sequences.

XI. ***Pseudohemihyalea carteronae*** (Toulgoët, 1982)

BIN BOLD:ACE8749 (in part)

(Fig. 5e-h, 12a-d, 14j)

Hemihyalea carteronae Toulgoët, 1982: 23.

Type locality. – Costa Rica, [Cartago], Cerro de la Muerte.

Type specimen. – Holotype male (MNHN).

Material examined. – **13** ♂, **11** ♀.

COSTA RICA

- **1** ♂, 19-BAES-00131 (Sequenced), (Dissected). Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, 2841 m, 29-30 de Agosto de 2019. Col. B. Espinoza. 9.56351, -83.71;
- **1** ♂, INB0003327971 (Sequenced). Prov. Cartago, El Guarco, Villa Mills – CATIE, 2840 m, 26-28 OCT 2000, R. Delgado, De Luz, 9.5583333, -83.6916667, #63093;
- **8** ♂, INB0003569404, INB0003569396, INB0003569408, INB0003569399, INB0003569409, INB0003569401, INB0003569405, INB0003569406. Prov. San José, Cerro de la Muerte, San Gerardo de Dota, 2430 m, 23 AUG 1981, D. H. Janzen & W. Hallwachs, 9.5543647, -83.8078478;
- **1** ♂, INB0004313472. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, km 92, Finca Los Nímbolos, 3300 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5617972, -83.74091944444444, #103640;
- **1** ♀, 22-BAES-01932 (Sequenced). Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, El Tanque, Camino a Buena Vista. 2770 m, 31 de Mayo de 2022, Col. B. Espinoza, 9.5505278, -83.6813638888889;
- **3** ♀, 19-BAES-00264 (Sequenced), (Dissected), 19-BAES-00265, 19-BAES-00272. Prov. Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, 2841 m, 29-30 de Agosto de 2019, Col. B. Espinoza, 9.56351,9.5539583, -83.68999166666667;
- **1** ♀, INB0004121602 (Sequenced). Prov. Cartago, R. F. Río Macho, Sector Villa Mills, Send. Robledales, 2762 m, 20-23 NOV 2007, B. Gamboa, M. Moraga, R. González, Tp. Luz, 9.5574769, -83.6866808, #92791;
- **3** ♀, INB0003569407, INB0003552109, INB0003569400. Prov. San José, Cerro de la Muerte, San Gerardo de Dota, 2430 m, 23 AUG 1981, D. H. Janzen & W. Hallwachs, 9.5543647, -83.8078478;
- **1** ♀, INBIOCRI002435840. Prov. San José, Est. Cuericí, 4.6 km al E. de Villa Mills, 2600 m, 21-26 SET 1995, A. Picado, de Luz, 9.5552958, -83.6703100, # 6307;
- **1** ♀, INB0004313376. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, kn 92, Finca Los Nímbolos, 3300 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5617972, -83.74091944444444, #103640;
- **1** ♀, INB0004313250. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, altura km 95, 1 km antes de la Georgina (Casa del Sr. Hilario), 3200 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5625278, -83.7331603, #103639. (Deposited MNCR).

PANAMA

- **1** ♂, Chiriqui, P.N. Volcan Baru, 1-IX-2016, 3045 m, Benoît Vincent leg., sequenced: sequenced process ID ARCTD1162-17, BOLD ID BEVI1916.
- **1** ♂, Chiriqui, P.N. Volcan Baru, 30-VIII-2016, 2500 m, Benoît Vincent leg., sequenced: sequenced process ID ARCTD1163-17, BOLD ID BEVI1917. (Deposited BVC).

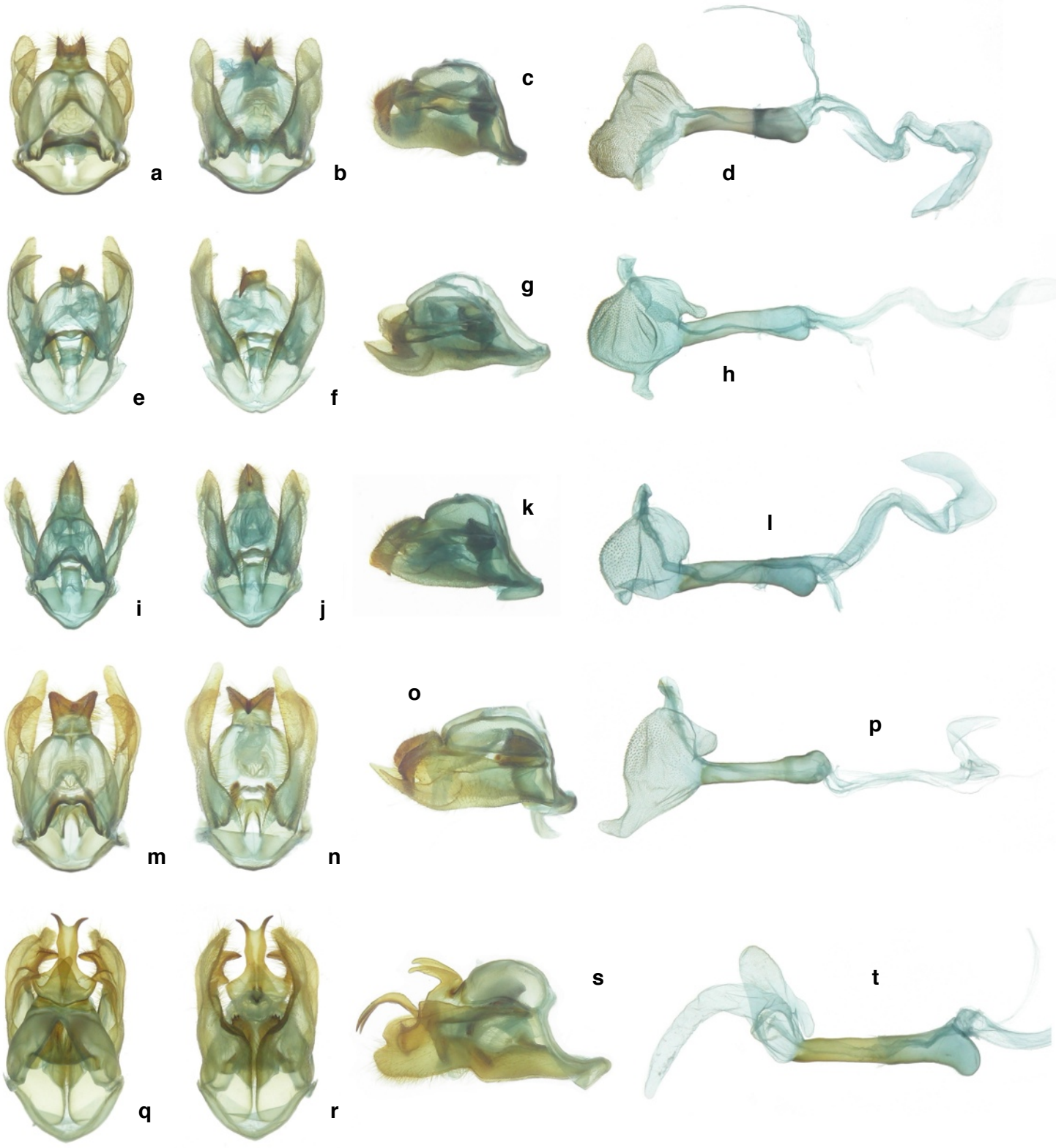

Figure 10. Male genitalia of *Pseudohemihyalea*.

a-d. *P. daraba* (Druce, 1894), INB0004160707. **a**. dorsal view. **b**. ventral view. **c**. lateral view. **d**. aedegus.
e-h. *P. donharveyi* **sp**. **n**., 19-BAES-00120. **e**. dorsal view. **f**. ventral view. **g**. lateral view. **h**. aedegus.
i-l. *P. anaisabelsanabriae* **sp**. **n**., 19-BAES-00062. **i**. dorsal view. **j**. ventral view. **k**. lateral view. **l**. aedegus.
m-p. *P. johnbrowni* **sp**. **n**., 19-BAES-00230. **m**. dorsal view. **n**. ventral view. **o**. lateral view. **p**. aedegus.
q-t. *P. incerta* Toulgoët, 1994, INBIOCRI001375739. **q**. dorsal view. **r**. ventral view. **s**. lateral view. **t**. aedegus.

Diagnosis. – This species can be recognized by its fawn-brown color on the body and forewings, which are also slightly hyaline in the basal half, with pale yellowish-brown transversal discontinuous bands in the postmedial and subterminal areas, or with pale yellowish irregular patches along costal area and in basal area. It is similar to *Pseudohemihyalea eugeniephillipsae* **sp**. **n**. in FW and HW background color, but *P. carteronae* is slightly smaller and has FW bands in females that are more marked and better defined. The basal processes of the uncus are very characteristic in both species. In *P. carteronae* this structure is formed by two elongate, thin projections, rounded at the tips, whereas in *P. eugeniephillipsae* **sp**. **n**., it is a broad structure with two short pointed projections.

Description

Adult male (Fig. 5e-f). INB0004313472.

For adult male description, see Toulgoët 1982, original publication. Forewing length 23.35-25.61 mm (n = 11).

Male genitalia (Fig. 12a-d). 19-BAES-00131.

Uncus elongated, thin, positioned at 90 degrees in relation to the costal margin of the valva, curved inward in the distal half, with a pointed tip, basal half formed by two thin elongated projections arising dorsally, with rounded tips and covered by short bristles. Tegumen bulky, with the anterior margin V-shaped. Valva broad basally and distally, costal margin straight, with a pointed and slightly curved inward tip, ventral margin covered by moderately long bristles, slightly lobulate in the basal half, with a pointed and slightly curved inward tip. Transtilla strongly sclerotized, projected over the anellus and covered by minute spinules. Juxta sclerotized, slightly convex, with the upper portion thinner than lower portion. Saccus elongate, with an open "V" shape. Aedeagus thin, elongated, slightly bent downward in the posterior end, vesica short, with two elongated lobes distally, one curved arising dorso-laterally to the left, with a pointed tip, the second one arising postero-laterally on the right, elbow-shaped and pointed at the tip.

Adult female (Fig. 5g, h). INB0004313376.

For adult male description, see Toulgoët 1982, original publication. Forewing length 25.03-27.95 mm (n = 12).

Female genitalia (Fig. 14j). 19-BAES-00264.

Papilla analis very broad and flattened, with a patch of short bristles dorsally. Lamella postvaginalis slightly sclerotized and transversally striated, opening of ostium bursae semi-circular, lamella antevaginalis composed by a broad, strongly sclerotized structure arising posteriorly, with two lobulate processes distally, with rounded tips. Ductus bursae sclerotized, elongated, curved, flattened dorso-ventrally. Corpus bursae elongated lobe shape, with the distal portion enlarged and striated longitudinally. Accessory bursae large and rounded.

Remarks. – *P. carteronae* is also one of the members of the six-species group sharing the same genetic sequence (BIN BOLD:ACE8749). Although adults of this species present some degree of intraspecific variation, its darker coloration on the FW, combined with the slight hyaline pattern on the basal half of the wing and the very pale yellowish-brown tone on the HW, make it easier to separate the species. Adults of this species were well characterized by Hervé de Toulgoët in the original description (Toulgoët, 1982), so here we focus only on male and female genitalia that need to be better characterized.

XII. ***Pseudohemihyalea despaignei despaignei*** (Toulgoët, 1982)
BIN BOLD:ACE8749 (in part)
(Fig. 6a-d, 12e-h, 14k)

Hemihyalea despaignei Toulgoët, 1982: 24.

Type locality. – Panama, [Chiriqui], Route de Boquete à Baru.

Type specimen. – Holotype male (MNHN).

Material examined. – **2** ♂, **1** ♀.

COSTA RICA

- **1** ♂, INB0003545185 (Sequenced), (Dissected). Prov. Cartago, P. N. Tapanti – Macizo de la Muerte, Estación La Esperanza, 2600 m, 01-31 Oct. 2002, Col. Roberto Delgado, Tp. de Luz, 9.6912903, -83.8768319, #71751;
- **1** ♀, INB0004313267. Prov. Cartago, Paraíso, R. F. Río Macho, Carretera Interamericana, altura km 95, 1 km antes de la Georgina (Casa del Sr. Hilario), 3200 m, 24-27 JUL 2007, B. Espinoza, Tp. de Luz, 9.5625278, -83.7331603, #103639. (Deposited MNCR).

COSTA RICA

- **1** ♂, San José, Cerro de la Muerte, 4-V-2010, 2722 m, M. Laguerre leg., sequenced: sequenced process ID ARCTD549-12, BOLD ID MILA1674. (Deposited MLC).

Diagnosis. – This subspecies can be recognized by its head and thorax slightly reddish ventrally; the abdomen dull black dorsally, with some light-reddish laterally. Forewing light brown, speckled with dark brown scales; area of discal cell, beyond it and below it, slightly darker and slightly hyaline. Hindwing also semihyaline, with a diffuse blackish anal area. The diffuse blackish tone partially dispersed on the wings is unique to this subspecies; none of the other Costa Rica species share this pattern.

Description

Adult male (Fig. 6a, b). INB0003545185.

For adult male description, see Toulgoët 1982, original publication. Forewing length 24.4 mm (n = 01).

Male genitalia (Fig. 12e-h). INB0003545185.

Uncus sclerotized, strongly ornamented on the basal half, with two short, wide and flattened processes arising dorsally, with a pointed and curved laterally tip, the inner surface membranous, distal half slightly elongated, thin and with a pointed tip. Tegumen slightly bulky and with the anterior margin concave. Valva sclerotized, elongated, wide basally and distally, costal margin straight in lateral view, with the tip rounded and slightly curved inward, ventral margin lobulated on the basal half and slightly rounded on the distal half, with a pointed and curved inward tip. Transtilla strongly sclerotized, projecting posteriorly over the anellus and covered by minute spines. Juxta sclerotized, slightly convex, wider basally and extended over the anellus by its ventral side. Saccus expanded, V-shaped. Aedeagus elongated, thin, very slightly curved ventrally on its posterior end, vesica short, rounded shape, with two large elongated lobes arising distally, one each side of the vesica, with pointed tips and bull-horn shaped.

Adult female (Fig. 6c, d). INB0004313267.

For adult female description, see Toulgoët 1982, original publication.

Female genitalia (Fig. 14k). INB0004313267.

Papilla analis very broad and flattened, almost square-shaped, with a patch of short bristles dorsally, apophysis anterior as long as the apophysis posterior. Lamella postvaginalis slightly sclerotized, transversally elongated, with a striated surface, opening of ostium bursae triangular-shaped, lamella antevaginalis composed by a broad, strongly sclerotized structure arising posteriorly, with two lobulate processes distally, with rounded tips. Ductus bursae sclerotized, elongated, flattened dorso-ventrally, curved medially in lateral view. Corpus bursae elongate, basal half thin, distal half thicker, lobe-shaped, very slightly striated longitudinally. Accessory bursae large and rounded.

Remarks. – This taxon is another member of the six-species group sharing the same genetic sequence (BIN BOLD:ACE8749). This subspecies is represented in CR collections by only two males and one female collected from high elevations of Cordillera de Talamanca, in the surroundings of Cerro de la Muerte. These Costa Rica specimens were compared with images of the holotype male specimen (MNHN, Paris EL 29222) and the allotype female specimen (MNHN, Paris EL 29223) and at this level, no differences were found. The male genitalia were compared with Toulgoët's published illustration of the holotype genitalia (Genitalia Prep. H. de Toulgoët No. AS 2076) and even though the drawing focuses only on some of the structures of the genitalia, these structures look highly consistent with those of the prepared Costa Rica male specimen. They differ slightly only in the shape of the anterior margin of the tegumen, which is deeply concave in Toulgoët's

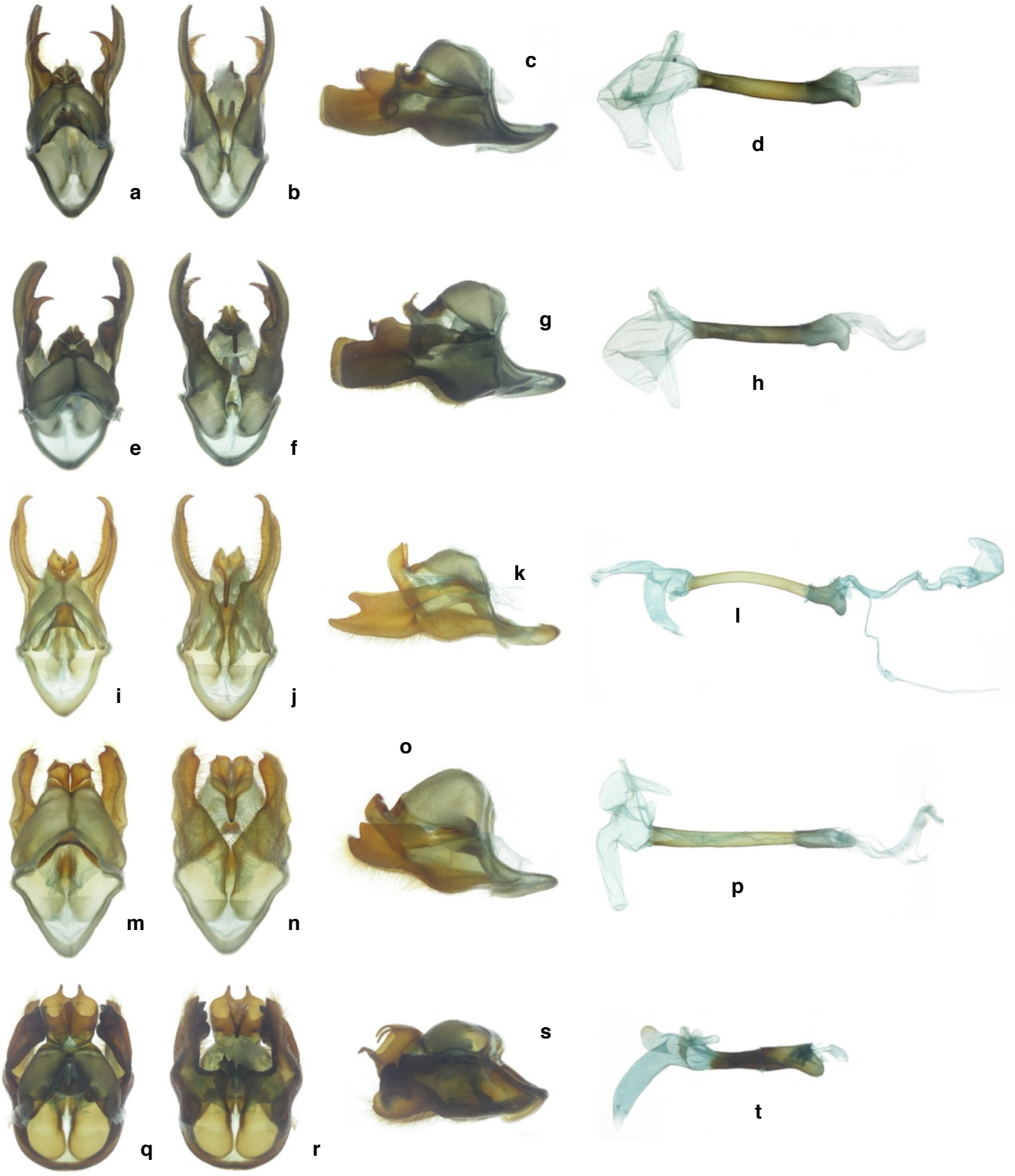

Figure 11. Male genitalia of *Pseudohemihyalea*.

a-**d**. *P. ochracea* (Rothschild, 1909), 19-BAES-00198. **a**. dorsal view. **b**. ventral view. **c**. lateral view. **d**. aedegus.
e-**h**. *P. annario* (Dyar, 1914), 19-BAES-00208. **e**. dorsal view. **f**. ventral view. **g**. lateral view. **h**. aedegus.
i-**l**. *P. anapheoides* (Rothschild, 1909), INB0004067500. **i**. dorsal view. **j**. ventral view. **k**. lateral view. **l**. aedegus.
m-**p**. *P. celsicola* (Toulgoët, 1982), INB0003769584. **m**. dorsal view. **n**. ventral view. **o**. lateral view. **p**. aedegus.
q-**t**. *P. schausi* (Rothschild, 1935), INB0004188199. **q**. dorsal view. **r**. ventral view. **s**. lateral view. **t**. aedegus.

illustration, while it is less deep in the CRn specimen. This discrepancy may be attributed to the inaccuracy of some drawings published by Toulgoët, for which the illustrations are very basic and focus only on some of the processes, probably considered by Toulgoët as the ones of relevance to be illustrated. Additionally, the female of this subspecies was associated and described by Toulgoët in his publication, but curiously, it was not dissected to characterize its genitalia structures. Thus, the Costa Rican female assigned to this subspecies, is determined by the morphological patterns shared with the female allotype, and by the fact that the female specimen comes from the same vicinity as the male studied. Unfortunately, DNA sequence of this female sample is still pending, and is not yet available to confirm all the above findings.

XIII. ***Pseudohemihyalea despaignei melanorubra*** Toulgoët, 1996
BIN BOLD: Not sequenced
(Fig. 6e-f, 12i-l)

Pseudohemihyalea despaignei melanorubra Toulgoët, 1996: 181.

Type locality. – Costa Rica, Heredia, Cerro Chompipe.

Type specimen. – Holotype male (MNCR).

Material examined. – **7** ♂.

COSTA RICA

- **1** ♂, INBIOCRI000183077, (H-T). Prov. Heredia, Res. Biol. Chompipe, C. Chompipe, R. F. Cord. Vol. Central 2000 m, 18 MAY 1990, J. F. Corrales, J. Ugalde, E. Phillips, 10.0884400, -84.0778811;
- **1** ♂, INBIOCRI000001720. Prov. Heredia, Braulio Carrillo N. P., Est. Barva, 2500 m, 01-30 April 1989, M. Zumbado & A. Fernandez, 10.1331750, -84.1211306;
- **1** ♂, INB0003218923. Prov. Heredia: 6km ENE Vara Blanca, 1950-2050 m, 19 FEB 2002, INBio-OET-ALAS transect. 20/L/02/020, 10.1761111, -84.1113889;
- **1** ♂, INB0003218794. Prov. Heredia: 6km ENE Vara Blanca, 1950-2050 m, 16 FEB 2002, INBio-OET-ALAS transect. 20/L/02/014, 10.1331750, -84.1211306;
- **1** ♂, INB0003219962 (Dissected). Prov. Heredia: 6km ENE Vara Blanca, 1950-2050 m, 13 Abril 2002, INBio-OET-ALAS transect. 20/L/02/055, 10.1331750, -84.1211306;
- **1** ♂, INB0003456441. Prov. San José, Pr. Nac. Braulio Carrillo, Estación Zurquí (el Tunel), 1500 m, 01-30 Nov. 1985, I. A. Chacón, 10.0677778, -84.0025000;
- **1** ♂, INBIOCRI001189792. Prov. Heredia, Res. Biol. Chompipe, C. Chompipe, R. F. Cord. Vol. Central 2100 m, 25 MAY 1993, J. F. Corrales, 10.0884339, -84.0705825. (Deposited MNCR).

Diagnosis. – This is the only entirely dark brown species, with semi-translucent middle areas of wings combined with a reddish ventral body, including the legs. No other species present in the country shares this unique composition of morphological patterns.

Description

Adult male (Fig. 6e-f). INBIOCRI000183077, (H-T).

For adult male description, see Toulgoët 1996, original publication. Forewing length 23.67-24.63 mm (n = 05).

Male genitalia (Fig. 12i-l). INB0003219962.

Uncus with two basal sclerotized thick projections arising dorsally, with a pointed and curved laterally tip, distal half moderately short, with a pointed tip, arising ventrally, in a straight position. Tegumen bulky-shaped in lateral view, with the posterior margin concave. Valva broad, costal margin slightly lobulate in the middle, slightly pointed and curved inward at the tip, ventral margin lobulate near the middle, with an acute and curved inward tip. Transtilla sclerotized, slightly projected posteriorly over the aedeagus, with a patch of tiny thick spines dorsally on the distal part. Juxta sclerotized, slightly convex, wider basally. Saccus elongated, open V-shaped. Aedeagus thin, elongated, vesica short, with two elongated lobes on distal portion, one arising to the right, bent-shaped and pointed at the tip, the second lobe arising to the left, slightly curved and projecting downward ventrally and pointed at the tip, coecum penis slightly broad and expanded dorsally.

Female. – Unknown (See remarks for female described).

Remarks. – In a subsequent personal note, written by hand and addressed to me, related to the publication of *P. despaignei melanorubra* paper, Hervé de Toulgoët warns that he made a mistake and the female described as *melanorubra* is actually the female of a different species, potentially new according to him. The correction was not formally made by him, Toulgoët just managed to alert us about the real status of the female described, so, here we make the corresponding clarification. On the other hand, at this point with no genetic sequences nor the life cycle of this subspecies, we have not enough evidence of male and female association for *P. despaignei melanorubra*, neither for the female species wrongly described by him as the *melanorubra* female. In consequence, the true female of *P. despaignei melanorubra* reminds still unknown. We hope that this problem can be solved in the future with more work in this genus and with more sequences of DNA available.

XIV. ***Pseudohemihyalea toulgoëti*** Espinoza **sp**. **n**.
BIN BOLD: Not sequenced
(Fig. 6g-j, 12m-p, 14l)
ZooBank: https://zoobank.org/B529DDDD-FC5D-46A4-B132-F91DA5890E47

Material examined. – **4** ♂, **10** ♀.

Holotype, ♂, INBIOCRI001876032. COSTA RICA, Prov. Puntarenas, Buenos Aires, P.I.L.A., Sector Altamira, A. C. Amistad, 1150-1400 m, 01-30 JUN 1994, R. Delgado, 9.0329867, -83.0108869, #3015.

Paratypes

COSTA RICA

- **1** ♂, INBIOCRI000213374. Prov. Puntarenas, P. N. Amistad, Fca. Cafrosa, Est. Las Mellizas, 1300 m, 01-30 APR 1990, M. Ramirez & G. Mora, 8.9041667, -82.7883333;
- **1** ♂, INBIOCRI000246729. Prov. Puntarenas, P. N. Amistad, Fca. Cafrosa, Est. Las Mellizas, 1300 m, R. Delgado, 19 JUN – 26 JUL 1990, 8.9041667, -82.7883333;
- **1** ♂, INBIOCRI002442602 (Dissected). Prov. Puntarenas, Estación Altamira, 1 km S del Cerro Biolley, 1450 m, 13-26 MAY 1996, R. Villalobos, de Luz, 9.0329867, -83.0108869, #7538;
- **1** ♀, INBIOCRI001153181. Prov. Cartago, Turrialba, Grano de Oro, Chirripó, 1120 m, 01-31 JUL 1993, P. Campos, 9.8183569, -83.4591633, #2253;
- **1** ♀, INBIOCRI001080900. Prov. Puntarenas, San Vito, Las Cruces Biol, Sta., 1200 m, 13-18 MAY 1988, I. Chacón, 8.7852778, -82.9594444;
- **1** ♀, INBIOCRI002477154 (Dissected). Prov. Puntarenas, Estación Altamira, 1 km S del Cerro Biolley, 1300-1400 m, 12-30 AGO 1996, R. Villalobos, de Luz, 9.0329867, -83.0108869, #8287;
- **1** ♀, INBIOCRI000156632. Prov. Puntarenas, P. N. Amistad, Fca. Cafrosa, Est. Las Mellizas, 1300 m, 01-30 NOV 1989, M. Ramirez & G. Mora, 8.9041667, -82.7883333;
- **1** ♀, INBIOCRI000532787. Prov. Puntarenas, P. Internac. La Amistad, Fca. Cafrosa, Est. Las Mellizas, 1300 m, G, Mora, MAY 1991, 8.9041667, -82.7883333;
- **1** ♀, INBIOCRI000555434. Prov. Puntarenas, P. Internac. La Amistad, Fca. Cafrosa, Est. Las Mellizas, 1300 m, G, Mora, JUN 1991, 8.9041667, -82.7883333;
- **1** ♀, INBIOCRI000002966. Prov. Puntarenas, P. N. Amistad, La Escuadra, 1340 m, 14 April 1989, M. Ramirez & G. Mora, 8.9876183, -82.9282106;
- **1** ♀, INBIOCRI002091786. Prov. Puntarenas, A. C. Amistad, Buenos Aires, Est. Altamira, 1150-1400 m, 01-31 DIC 1994, M. Segura, 9.0329867, -83.0108869, #3377;
- **1** ♀, INBIOCRI000940118. Prov. Cartago, Turrialba, Grano de Oro, Chirripo, 1120 m, 04 OCT 1992, J. F. Corrales, 9.8183569, -83.4591633;
- **1** ♀, INBIOCRI001289665. Prov. Cartago, Turrialba, Grano de Oro, Chirripo, 1120 m, FEB 1993, P. Campos, 9.8183569, -83.4591633;

(Deposited MNCR).

Diagnosis. – *P. toulgoëti* **sp**. **n**. is characterized by its fawn and finely speckled background color on FW and imperfect transversal pale-yellowish bands, combined with a dark brown inner margin and outer margin. This species is closely related to *P. mansueta* Ewards, 1884, but P. *toulgoëti* **sp**. **n**. differs from that species by the shape of uncus basally,

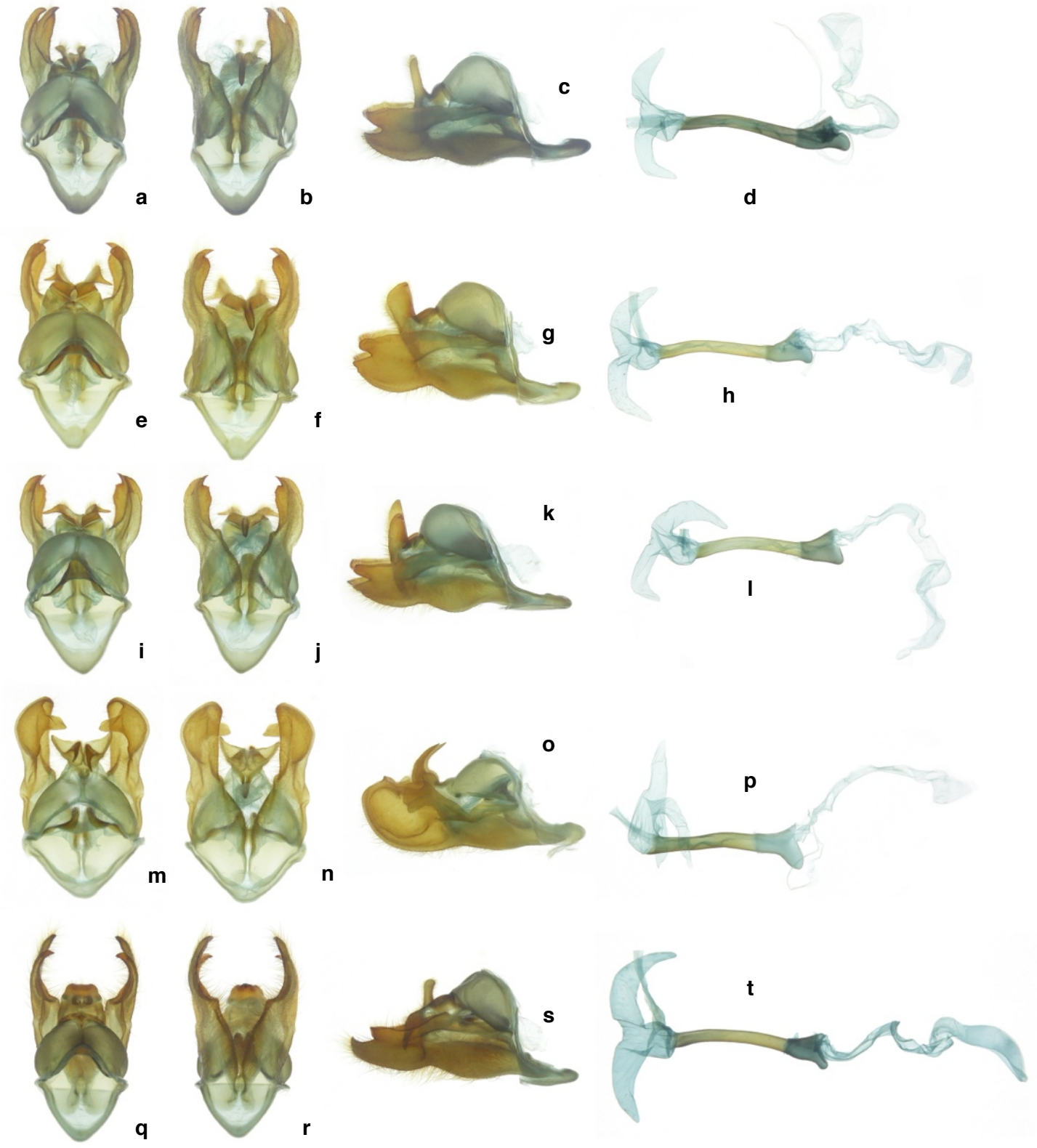

Figure 12. Male genitalia of *Pseudohemihyalea*.
a-d. *P. carteronae* (Toulgoët, 1982), 19-BAES-00131. **a**. dorsal view. **b**. ventral view. **c**. lateral view. **d**. aedegus.
e-h. *P. despaignei despaignei* (Toulgoët, 1982), INB0003545185. **e**. dorsal view. **f**. ventral view. **g**. lateral view. **h**. aedegus.
i-l. *P. despaignei melanorubra* Toulgoët, 1996, INB0003219962. **i**. dorsal view. **j**. ventral view. **k**. lateral view. **l**. aedegus.
m-p. *P. toulgoëti* **sp**. **n**., INBIOCRI002442602. **m**. dorsal view. **n**. ventral view. **o**. lateral view. **p**. aedegus.
q-t. *P. rexhamiltoni* **sp**. **n**., INB0004147511. **q**. dorsal view. **r**. ventral view. **s**. lateral view. **t**. aedegus.

which is formed by a very broad and flattened structure, expanded laterally, concave-shaped, with the posterior margin straight, and two elongate and pointed distally processes arising dorsally, horn-shaped, covered with very short bristles. This basal structure of uncus is more reduced in size in *P. mansueta* than in *P. toulgoëti* **sp**. **n**.. In addition to the above, the valva is notoriously different in shape of tip in both species, with a deeper concavity in *P. toulgoëti* **sp**. **n**. than in *P. mansueta*. On the other hand, adult males of *P. mansueta* from Guatemala and Mexico share a strongly highlighted dark brown antenna, while in P. *toulgoëti* **sp**. **n**. the male has a lighter dark brown antenna.

Description

Adult male (Fig. 6g, h). INBIOCRI001876032.

Forewing length 24.32-27.45 mm (n = 04). Head and thorax fawn color, palpus upturned, moderately long, with lateral surface dark brown, distal segment very short. Antenna bipectinate, brown color. Legs with dark brown tarsi, foreleg with orange on femur and a dark brown spot distally, midlegs and forelegs with dark brown on tibia. Forewing fawn and finely speckled background color, with pale yellowish transversal imperfect bands, inner margin dark brown, outer margin with interspersed segments of dark brown and pale yellowish cilia. Hindwing semihyaline, with anal area pink-orange. Abdomen reddish-orange dorsally, segments 1 to 5 hairy, ventrally pale-yellowish.

Male genitalia (Fig. 12m-p). INBIOCRI002442602.

Uncus short on the distal half, strongly ornamented on the basal half, with a flattened structure, expanded laterally, concave-shaped, with the posterior margin straight, and two elongated and pointed distally processes arising dorsally, horn-shaped, covered with very short bristles. Valva broad basally and distally, distal half strongly concave, with the ventral margin rounded, costal margin strongly constricted near the middle, with a short semi-triangular process on the distal part, a sclerotized short process, flattened, in a transversal position and arising inward. Transtilla sclerotized, with two short projections, covered by thick and short spines, central portion membranous. Juxta slightly sclerotized, longer than wide, slightly convex. Saccus short. Aedeagus sclerotized, elongated, with the coecum penis bulky ventrally. Vesica, elongated, with a pointed tip, two thin, elongated lobes arising on the middle part, projecting ventrally, one on the left and the second on the right.

Adult female (Fig. 6i, j). INBIOCRI000156632.

No sexual dismorphism is present. Forewing length 24.58-29.41 mm (n = 10).

Female genitalia (Fig. 14l). INBIOCRI002477154.

Papilla analis slightly trapezoidal-shaped, covered by a mixture of long and short bristles, a distinctive patch of short bristles dorso-laterally. Apophysis posterior two times the length of apophysis anterior, apophysis anterior thicker than apophysis posterior, lamella antevaginalis widened, with the posterior margin prominent, constricted in the middle and scarcely covered with moderately long bristles, lamella postvaginalis very slightly sclerotized and slightly striate, ostium bursae sclerotized, flattened and with a crescent-moon shape, ductus bursae, sclerotized, slightly elongated, thick and flattened dorso-ventrally, corpus bursae nut-shaped, longitudinally striate, with the basal portion thinner and rolled up-shaped, with a short lobe projected dorsally, accessory bursae arising dorsally on the basal part of corpus bursae.

Etymology. – *Pseudohemihyalea toulgoëti* **sp**. **n**. is dedicated to Hervé de Toulgoët in recognition of his long taxonomic career and extensive legacy in advancing knowledge of the Neotropical Arctiinae.

Remarks. – This species was previously identified by Hervé de Toulgoët as *Pseudohemihyalea mansueta*, a species originally described from Mexico, Veracruz by Edwards in 1884. However, after a detailed revision of male and female genitalia, we concluded that the specimens from Costa Rica belong to a different taxon than *P. mansueta*. The true *P. mansueta* appears to be more geographically restricted to Mexico and does not occur in Costa Rica. Therefore, the taxon found here is described as a new species, and it is considered a member of the *P. mansueta* species complex, which includes the true *P. mansueta* from Mexico, a potentially undescribed second species from Guatemala and this new species described here from Costa Rica.

XV. ***Pseudohemihyalea rexhamiltoni*** Espinoza **sp**. **n**.

BIN BOLD: ABZ6563

(Fig. 7a-d, 12q-t, 14m)

ZooBank: https://zoobank.org/11AFEA59-B716-411D-9E18-AF5B1D10D058

Material examined. – **28** ♂, **22** ♀.

Holotype, ♂, 11-SRNP-101054. COSTA RICA, Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Sendero Perdido, 1762 m, F. Quesada & H. Cambronero, 03 MAR 2011, 10.80639, -85.32158.

Paratypes

COSTA RICA

- **4** ♂, 11-SRNP-101056 (Dissected), 11-SRNP-101055, 11-SRNP-101057, 11-SRNP-101058. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Sendero Perdido, 1762 m, 02 MAR 2011, F. Quesada & H. Cambronero, 10.80639, -85.32158;
- **4** ♂, 11-SRNP-101307, 11-SRNP-101308, 11-SRNP-101309, 11-SRNP-101310. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Sendero Perdido, 1762 m, S. Rios & R. Franco, 03 MAR 2011, 10.80639, -85.32158;
- **1** ♂, 11-SRNP-100550. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Sendero Perdido, 1762 m, 02 FEB 2011, H. Cambronero & F. Quesada, 10.80639, -85.32158;
- **1** ♂, 11-SRNP-101214. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Claro, 1610 m, S. Rios & R. Franco, 02 MAR 2011, 10.80345, -85.32621;
- **1** ♂, 11-SRNP-100630. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Claro, 1610 m, S. Rios & R. Franco, 02 FEB 2011, 10.80345, -85.32621;
- **1** ♂, INB0004147511 (Sequenced), (Dissected). Prov. Alajuela, P. N. Volcán Tenorio, Punto 4: Cerro Montezuma, 1400-1500 m, 27 MAY 2008, J. A. Azofeifa, Tp. de Luz, 10.6951542, -85.0276017. #93820;
- **2** ♂, INB0003448555, INB0003448556. Prov. Guanacaste, Derrumbe, Estac. Mengo, W side Volcan Cacao, 1400 m, 11 JUL 1988, D. H. Janzen & W. Hallwachs, 10.9337322, -85.4612886;
- **1** ♂, INB0004441791. Prov. Guanacaste, Estación Mengo, SW side Volcán Cacao, 1100 m, JUL 1987, D. H. Janzen & W. Hallwachs. 10.9282719, -85.4713317;
- **2** ♂, INB0003218813, INB0003218808. Prov. Heredia, 6 km ENE Vara Blanca, 1950-2050 m, 16 FEB 2002, INBio-OET-ALAS transect, 20/L/02/014, 10.1761111, -84.1113889;
- **1** ♂, INB0003217721. Prov. Heredia, 6 km ENE Vara Blanca, 1950-2050, 10º 11' N, 84º 07' W, INBio-OET-ALAS transect, 16 FEB 2002, 20/L/02/002, D. Wagner, A. Kawahara, J. Rota, 10.1761111, -84.1113889;
- **2** ♂, INB0004169551 (Sequenced), INB0004169553 (Sequenced). Prov. Alajuela, Guatuso, P. N. Volcán Tenorio, Punto 4: Cerro Montezuma, 1510 m, 21 SEP 2008, J. A. Azofeifa, Tp. de Luz Mercurio, 10.6951542, -85.0276017, #94904;
- **1** ♂, INB0004170067 (Sequenced). Prov. Alajuela, Guatuso, P. N. Volcán Tenorio, Punto 4: Cerro Montezuma, 1510 m, 27 AGO 2008, J. A. Azofeifa, Tp. de Luz, 10.6951542, -85.0276017, #94879;
- **1** ♂, INB0004169718 (Sequenced). Prov. Alajuela, Guatuso, P. N. Volcán Tenorio, Punto 4: Cerro Montezuma, 1510 m, 1 SEP 2008, J. A. Azofeifa, Tp de Luz Mercurio, 10.6951542, -85.0276017, #94906;
- **1** ♂, INB0004144846 (Sequenced). Prov. Alajuela, Guatuso, P. N. Volcán Tenorio, Punto 4: Cerro Montezuma, 1510 m, 13-14 MAY 2008, J. A. Azofeifa, Tp. Luz, 10.6951542, -85.0276017, #93695;
- **1** ♂, INB0003708306. Prov. Guanacaste, Macizo Miravalles, Estación Cabro Muco, 1100 m, 26 MAR – 03 ABR 2003, J. D. Gutiérrez. Tp. de Luz, 10.7183333, -85.1447222, #73494;
- **2** ♀, 11-SRNP-101059, 11-SRNP-101060. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Sendero Perdido, 1762 m, 02 MAR 2011, F. Quesada & H. Cambronero, 10.80639, -85.32158;
- **2** ♀, 11-SRNP-101213, 11-SRNP-100631. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Claro, 1610 m, 02 FEB 2011, S. Rios & R. Franco, 10.80345, -85.32621;
- **1** ♀, 10-SRNP-108012. Prov. Guanacaste, Area de Conservación Guanacaste, Sector Cacao, Derrumbe, 1310 m, F. Quesada & S. Rios, 12 MAY 2010, 10.93110, -85.46194;
- **1** ♀, 11-SRNP-101417 (Dissected). Prov. Guanacaste, Area de Conservación Guanacaste, Sector Santa Maria, Manta Claro, 1610 m, F. Quesada & H. Cambronero, 03 MAR 2011, 10.80345, -85.32621;

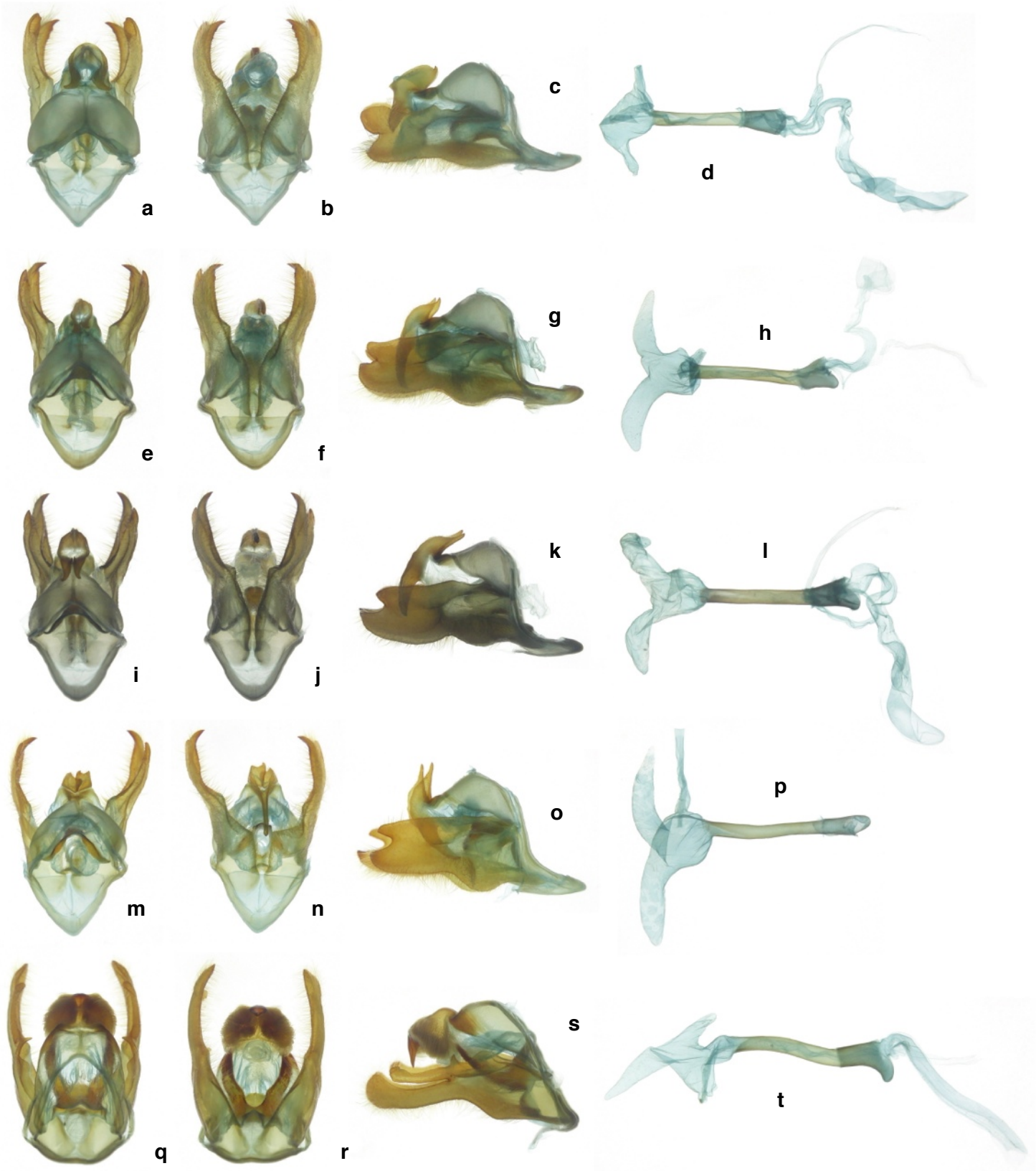

Figure 13. Male genitalia of *Pseudohemihyalea*.

a-d. *P. bosullivani* **sp. n.**, INB0003487083. **a**. dorsal view. **b**. ventral view. **c**. lateral view. **d**. aedegus.
e-h. *P. montywoodi* **sp**. **n**., INB0003554656. **e**. dorsal view. **f**. ventral view. **g**. lateral view. **h**. aedegus.
i-l. *P. eugeniephillipsae* **sp**. **n**. INBIOCRI000225873. **i**. dorsal view. **j**. ventral view. **k**. lateral view. **l**. aedegus.
m-p. *P. marcepsteini* **sp**. **n**., INB0003217612. **m**. dorsal view. **n**. ventral view. **o**. lateral view. **p**. aedegus.
q-t. *P. fuscescens* (Rotschild, 1909), INB0004184779. **q**. dorsal view. **r**. ventral view. **s**. lateral view. **t**. aedegus.

- **2** ♀, INB0003708308 (Sequenced), INB0003708303. (Sequenced). Prov., Guanacaste, Macizo Miravalles, Estación Cabro Muco, 1100 m, 26 MAR-03 ABR 2003, J. D. Gutiérrez, Tp. de Luz, 10.7183333, -85.1447222, #73494;
- **4** ♀, INB0003707427 (Sequenced), (Dissected), INB003707368 (Sequenced), INB0003707420 (Sequenced), INB0003707421 (Sequenced) (Dissected). Prov. Guanacaste, Macizo Miravalles, Estación Cabro Muco, 1100 m, 28 MAR-02 ABR 2003, J. Azofeifa, Tp. de Luz, 10.7183333, -85.1447222, #73467;
- **1** ♀, INB0003709784 (Sequenced). Prov. Guanacaste, Macizo Miravalles, Estación Cabro Muco, 1100 m, 28 MAR – 03 ABR 2003, B. Hernández, Luz Mercurio, 10.7183333, -85.1447222, #73494;
- **1** ♀, INB0004169997 (Sequenced), (Dissected). Prov. Alajuela, Guatuso, P. N. Volcán Tenorio, Punto 4: Cerro Montezuma, 1510 m, 27 AGO 2008, J. A. Azofeifa, Tp. de Luz, 10.6951542, -85.0276017, #94879;
- **1** ♀, INB0003968447 (Sequenced). Prov. Guanacaste, P. N. Miravalles, Volcán Miravalles, 1500 m, 04 JUL 2005, J. Azofeifa, I. Lopez, H. Aguilar, Tp. de Luz Mercurio, 10.7474911, -85.1653156, #84195;
- **1** ♀, INB0004169511 (Sequenced). Prov. Alajuela, Guatuso, P. N. Volcán Tenorio, Punto 4: Cerro Montezuma, 1510 m, 21 SEP 2008, J. A. Azofeifa, Tp. de Luz Mercurio, 10.6951542, -85.0276017, #94904;
- **2** ♀, INB0003708301 (Sequenced), INB0003708311 (Sequenced). Prov. Guanacaste, Macizo Miravalles, Estación Cabro Muco, 1100 m, 26 MAR03 ABR 2003, J. D. Gutiérrez, Tp. de Luz, 10.7183333, -85.1447222, #73494. (Deposited MNCR).

COSTA RICA

- **3** ♂, **7** ♀, Cartago, P.N. Tapanti, 9-V-2010, 1515 m, M. Laguerre leg., two males dissected gen. ML2012 & 2023, two males and one female sequenced: sequenced process ID ARCTC986-11, BOLD ID MILA1448, sequenced process ID ARCTC988-11, BOLD ID MILA1450 and sequenced process ID ARCTC987-11, BOLD ID MILA1449 (yellow printed labels).
- **1** ♀, Cartago, P.N. Tapanti, 8-V-2010, 1632 m, M. Laguerre leg. (Deposited MLC).

Diagnosis. – This species can be recognized by its pale yellowish elongated patch basally on inner margin of FW, and by the distally spearhead-shaped uncus. This latter character is absent in all other Costa Rica species, making it the easiest way to distinguish this species from other congeneric species reported in the country.

Description

Adult male (Fig. 7a, b). 11-SRNP-101054.

Forewing length 26.20-31.91 mm (n = 25). Head and thorax light brown, palpus elongated, almost reaching the vertex of head, with dark brown laterally, antenna bipectinate, brown color, scape and pedicel yellowish-brown. Legs with dark brown on tibiae and tarsi, foreleg with orange on femur. Forewing dark brown background color, with a uniform maculation or with a subterminal series of pale yellowish irregular patches, two to four pale yellowish patches along subcostal area, inner margin with a basal pale yellowish elongated patch and a medial pale yellowish spot, outer margin darker. Hindwing pale yellowish, semihyaline in the area of discal cell, beyond it and below it. Abdomen dorsally light orange pink, densely hairy on tergite 1 to 5, ventrally yellowish brown.

Male genitalia (Fig. 12q-t). INB0004147511.

Uncus triangular, spearhead-shaped, curved downward ventrally, two short basal processes arising dorsally, with a rounded tip, base of uncus wide, tegumen bulky, with the posterior margin concave. Valva elongated, sclerotized, costal margin with moderately long bristles, slightly lobulate medially and with a curved inward tip, ventral margin with long bristles, slightly lobulate on the basal half, the tip slightly pointed and curved inward. Transtilla strongly sclerotized, with a wide process, arising medially, forked distally and densely covered by thick and short spines. Juxta elongated, thin, slightly thicker in the lower portion, irregularly expanded in the upper portion and very slightly convex. Saccus wide and expanded. Aedeagus elongated, slightly curved, coecum penis slightly bulky, vesica short, with two elongated lobes with pointed tips, arising laterally on the distal part, one on to left side and the second to the right side of vesica.

Adult female (Fig. 7c, d). 11-SRNP-101060.

Forewing length 24.20-30.03 mm (n = 18). Female light brown, with uniform maculation or with a subterminal series of pale yellowish irregular patches on forewing. Hindwing lighter.

Female genitalia (Fig. 14m). INB0004169997.

Papilla analis semi-rectangular shape, covered by a mixture of long and short bristles, a distinctive patch of short bristles dorso-laterally. Apophysis posterior the same size than apophysis anterior, sterigma slightly sclerotized and prominent, lamella antevaginalis sclerotized, projected posteriorly with an irregular bilobulate tip, lamella postvaginalis very broad, expanded laterally, very slightly striate in the central portion, ostium bursae elongated, closed-shaped, ductus bursae elongated, sinuated, sclerotized and flattened dorso-ventrally, corpus bursae elongated, longitudinally striate, basal portion thin and arising to the right, distal portion lobe-shaped. Accessory bursae larger than corpus bursae, rounded-shaped.

Etymology. – *Pseudohemihyalea rexhamiltoni* **sp**. **n**. is dedicated to Rex Hamilton of Costa Rica, Florida and France for his enthusiastic membership of the Board of Directors for the Guanacaste Dry Forest Conservation Fund that supports Area de Conservacion Guanacaste, which contains the three volcanic upper elevations inhabited by this species, to date only captured with Light Traps, not yet reared.

Remarks. – This species is an abundant in the Cordillera de Guanacaste, in the ACG and surrounding areas, as well as in the Cordillera Volcánica Central, at elevations of 1100 - 2050 m. The distal shape of uncus makes this species unmistakable and easy to separate from other *Pseudohemihyalea* species by examining this structure under the microscope, as it is prominent, normally exposed, and easily visible.

XVI. ***Pseudohemihyalea bosullivani*** Espinoza **sp**. **n**.

BIN BOLD: ACE8749 (in part)

(Fig. 7e, f, 13a-d)

ZooBank: https://zoobank.org/5C7783D2-466B-4288-ACAF-12A5669C1706

Material examined. – **4** ♂.

Holotype, ♂, INB0004313461. COSTA RICA, Prov. Cartago, P.N. Tapantí, Paraíso, R. F. Río Macho, Carretera Interamerica, km 92, Finca Los Nímbolos, 3300 m, 24-27 Julio 2007, Col. B. Espinoza, Tp de Luz, 9.5617972, -83.74091944444444, #103640.

Paratypes

COSTA RICA

- **1** ♂, INB0003487083 (Sequenced), (Dissected). Prov. Cartago, P. N. Tapantí – Macizo de la Muerte, Sector La Esperanza, 2700 m, May 2002. Col. R. Delgado, Tp. de Luz. 9.6939697, -83.8545039, #69498.
- **1** ♂, INB0003487082 (Sequenced), (same locality).

(Deposited MNCR).

COSTA RICA

- **1** ♂, San José, Cerro de la Muerte, 4-V-2010, 2722 m, M. Laguerre leg., dissected Gen. ML3916. (Deposited MLC).

Diagnosis. – Adults with semihyaline wings, as well as the basal portion of uncus with a prominent structure, projected dorsally, semirounded, concave and internally membranous, with the anterior part open, and ending in two small horns that arise laterally. This species shares similar background color patterns on FW and HW with *P. carteronae*, but in *Pseudohemihyalea sullivani* **sp**. **n**. the series of ovoid pale patches are restricted to the subterminal area of FW, while *P. carteronae* has discontinuous pale bands on the subterminal and postmedial areas, or pale yellowish irregular patches along the costal area and in basal area of FW.

Description

Adult male (Fig. 7e, f). INB0004313461.

Forewing length 24.74-25.46 mm (n = 03). Head, thorax and abdomen brown. Palpus dark brown laterally, front and vertex of head hairy, antenna bipectinate, light brown, barely exceeding half the length of the forewing, thorax hairy, legs brown with a dark brown spot distally on femora, forefemur with an orange-brownish tone. Forewing brown, slightly hyaline, with a small elongated patch, pale yellowish, diffuse on inner margin basally, a subterminal series of ovoid pale patches that decrease in size toward the tornus. Hindwing semihyaline, pale-whitish.

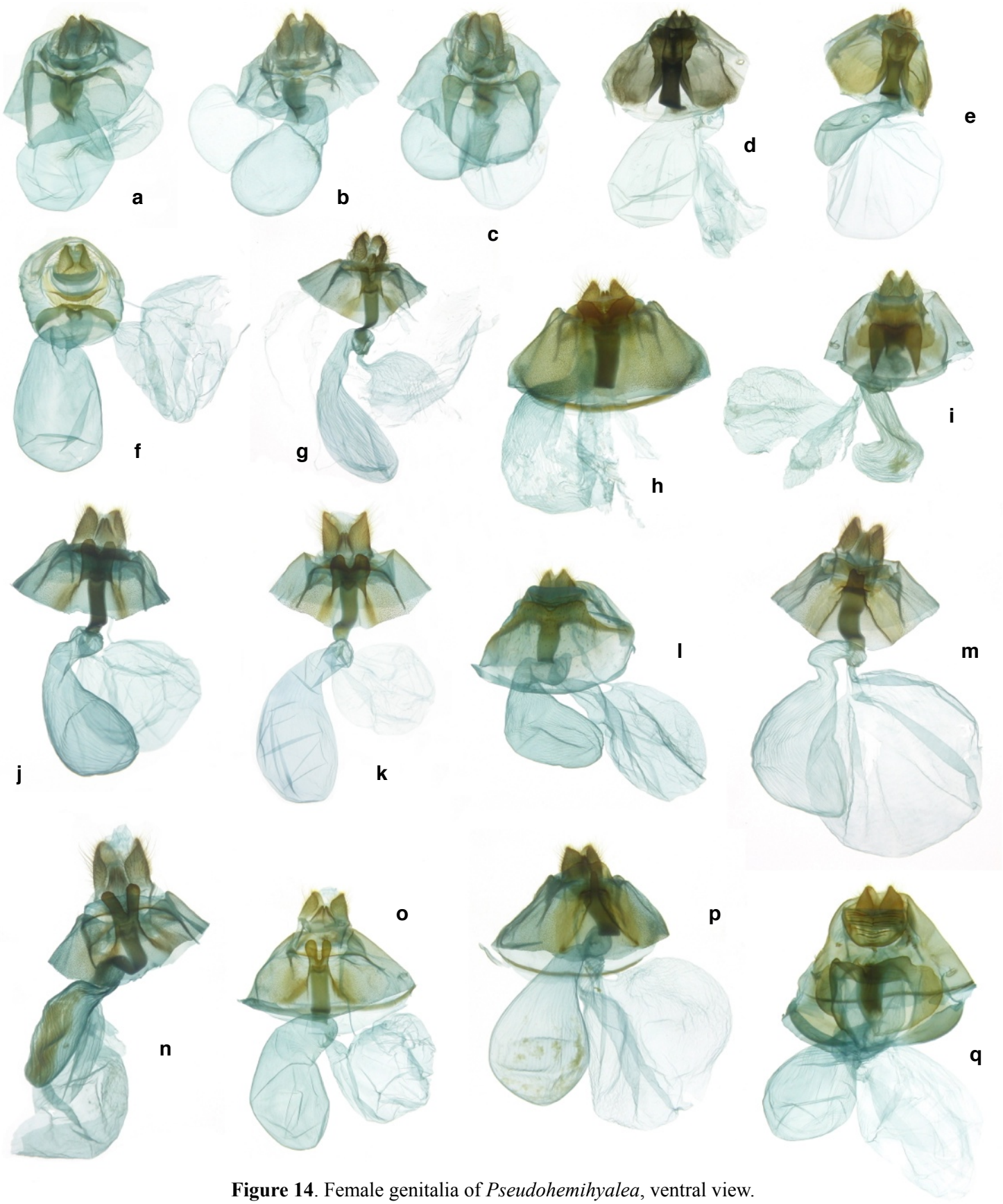

Figure 14. Female genitalia of *Pseudohemihyalea*, ventral view.

a. *P. donharveyi* **sp**. **n**., 19-BAES-00121. **b**. *P. anaisabelsanabriae* **sp**. **n**., 19-BAES-00597. **c**. *P. johnbrowni* **sp**. **n**., 19-BAES-00215. **d**. *P. ochracea* (Rothschild, 1909), 19-BAES-00207. **e**. *P. annario* (Dyar, 1914), 19-BAES-00108. **f**. *P. incerta* Toulgoët, 1994, INB0003520581. **g**. *P. anapheoides* (Rothschild, 1909), INB0004067455. **h**. *P. celsicola*, (Toulgoët, 1982), INB0003521462. **i**. *P. schausi* (Rothschild, 1935), INB0004208520. **j**. *P. carteronae* (Toulgoët, 1982), 19-BAES-00264. **k**. *P. despaignei despaignei* (Toulgoët, 1982), INB0004313267. **l**. *P. toulgoëti* **sp**. **n**., INBIOCRI002477154. **m**. *P. rexhamiltoni* **sp**. **n**., INB0004169997. **n**. *P. montywoodi* **sp**. **n**., INB0003769581. **o**. *P. eugeniephillipsae* **sp**. **n**., INB0003429648. **p**. *P. corralesi* Toulgoët, 1996, INB0003409195. **q**. *P. fuscescens* (Rotschild, 1909), INB0003035275.

Male genitalia (Fig. 13a-d). INB0003487083.

Uncus short, thick, basal portion with a prominent structure, projected dorsally, semirounded, concave and internally membranous, with the anterior part opened, and ending in two small curved-horns, that arise laterally. Tegumen bulky, with anterior margin slightly concave. Valva elongated, broad basally and apically, costal margin with a medial small protuberance, triangular-shaped, with a rounded tip, ventral margin very slightly lobulate basally, with a pointed and curved inward tip and covered by moderately long bristles. Transtilla sclerotized, projecting posteriorly over the anellus, with the distal portion bifid and spinulate. Juxta elongated, slightly sclerotized, lower half very slightly convex, upper half projecting posteriorly along the lower part of anellus, saccus V-shaped. Aedeagus elongated, thin, vesica short, with two elongated lobes dorsally, one arising on the left, with a pointed and small elbow-shaped tip, the second lobe thinner, arising dorsally and projected anteriorly.

Female. – Unknown.

Etymology. – This species is named in honor of my dear friend James Bolling Sullivan III, an outstanding Lepidoptera taxonomist and an exceptional human being. It was my distinct pleasure to collaborate with him for many years, including a decade of fieldwork and collecting expeditions throughout Costa Rica. These joint efforts yielded significant material for our collections, including numerous species new to science.

Remarks. – This is a very scarce species, known only from high elevations of Macizo de la Muerte (Cordillera de Talamanca), in areas of moorlands forest and rainy forest. The species is a member of the six-species complex sharing the BIN BOLD:ACE8749, but is clearly well separated by adult morphology and shape of the genitalia structures.

XVII. ***Pseudohemihyalea montywoodi*** Espinoza **sp**. **n**.

BIN BOLD: ACE8749 (in part)

(Fig. 7g-j, 13e-h, 14n)

ZooBank: https://zoobank.org/0404A508-1EAD-4DD5-ABFD-66CD232C9129

Material examined. – 6 ♂, 6♀.

Holotype, ♂, INB0003487069. COSTA RICA, Prov. Cartago, El Guarco, R.F. Río Macho, Macizo de la Muerte, Sector de la Esperanza, 2600m., 01-31 MAY 2002, Col. R. Delgado, Tp de Luz, 9.6867708, -83.8777497, #69497.

Paratypes

COSTA RICA

- **1** ♂, INB0003554656 (Dissected), Prov. Cartago, El Guarco, R.F. Río Macho, Macizo de la Muerte, Sector de la Esperanza, 2600 m, 01-30 NOV 2002, Col. R. Delgado, Tp de Luz. 9.6867708, -83.8777497, #72178
- **1** ♂, INB0003339633, Prov. Cartago, P. N. Tapantí, El Guarco, Macizo de la Muerte, Est. La Esperanza, 2600-2700 m, 01-31 JUL 2001, Col. R. Delgado, Tp de Luz, 9.6867708, -83.8777497, #63496;
- **1** ♀, INB0003554659 (Sequenced). Prov. Cartago, El Guarco, Macizo de la Muerte, Sector de la Esperanza, 2650 m, 01-30 NOV 2002, Col. R. Delgado, Tp de Luz, 9.6867708, -83.8777497, #72178;
- **1** ♀, INB0003769609 (Sequenced). Prov. Limón, P. Int. La Amistad, Talamanca, Sabanas Durika, 2400 -2500 m, 22 SEP 2003, Col. M. Alfaro. Tp de Luz. 9.4154847, -83.3182069, #75709;
- **1** ♀, INB0003769581 (Sequenced), (Dissected). Prov. Puntarenas, R.I. Ujarrás-Salitre-Cabagra, Buenos Aires, Cerro Aká, 3179 m, 20 SEP 2003, Col. M. Alfaro, Tp de Luz, 9.3798533, -83.3119772, #75464. (Deposited MNCR).

COSTA RICA

- **2** ♂, **1** ♀, San José, Cerro de la Muerte, 14-IX-2009, 2722 m, D. Herbin leg., one male dissected Gen. ML1937, all sequenced: sequenced process ID ARCTC1012-11, BOLD ID MILA1474, sequenced process ID ARCTC1013-11, BOLD ID MILA1475 and sequenced process ID ARCTC1014-11, BOLD ID MILA1475 (yellow printed labels).
- **1** ♂, San José, Cerro de la Muerte, 4-V-2010, 2722 m, M. Laguerre leg. (Deposited MLC).

Supplementary material

COSTA RICA

- **2** ♀, San José, Cerro de la Muerte, 4-V-2010, 2722 m, M. Laguerre leg. All sequenced: sequenced process ID ARCTD708-12, BOLD ID MILA1833 and sequenced process ID ARCTD709-12, BOLD ID MILA1834 (yellow printed labels). (Deposited MLC).

Diagnosis. – This is one of the few darkest dark brown species with semihyaline brilliant wings of the *Pseudohemihya* species present in Costa Rica. This characteristic darker tone is shared only by *P. despaignei melanorubra*, but *melanorubra* additionally has a reddish ventral body, including the legs, while in *P. montywoodi* **sp**. **n**. the body and and legs are also dark brown. This is the easiest way to sort these two taxa apart.

Description

Adult male (Fig. 7g, h). INB0003487069.

Forewing length 24.59-25.99 mm (n = 03). Head, thorax, abdomen legs and wings dark brown. Palpi, frons and vertex of head darker. Frons, vertex of head and thorax hairy. Antenna bipectinate, dark brown, with a lighter tip, almost ¾ the length of forewing. Forewing semihyaline brilliant, hindwing semihyaline brilliant. Abdomen dark brown dorsally and light brown ventrally.

Male genitalia (Fig. 13e-h). INB0003554656.

Uncus sclerotized, elongated, slightly curved and with a pointed tip, basal portion concave, with two short projections, pointed at the tip, arising dorsally and very slightly curved laterally. Tegumen slightly bulky, with anterior margin concave. Valva broad basally and distally, ventral margin lobulate on the basal half, with a pointed and curved inward tip and covered by long bristles, costal margin basically straight and slightly acute at the tip. Transtilla sclerotized, projecting posteriorly over the anellus, with the distal portion spinulate. Juxta elongated, slightly sclerotized, very slightly convex, thinner on the upper portion. Saccus expanded anteriorly. Aedeagus elongated, sclerotized, opening of coecum penis slightly expanded dorsally, vesica short, with two elongated lobes on the distal portion, one arising dorsally to the left side, with a pointed tip and the second one arising posteriorly and to the right and slightly thicker than the first lobe.

Adult female (Fig. 7i, j). INB0003554659.

Forewing length 27.38-28.14 mm (n = 03). Sexual dimorphism is present. Head, thorax and abdomen light brown, antenna with smaller flagellomeres, thorax and basal half of abdomen hairy, legs light brown, abdomen ventrally lighter. Forewing light brown, speckled with dark scales, areas of discal cell, beyond it and below it until anal vein semihyaline, transversal series of small elongate black-edged spots in postmedial and subterminal area. Hindwing semihyaline with a creamy background color.

Female genitalia (Fig. 14n). INB0003769581.

Papilla analis rectangular, covered by a mixture of long and short bristles, with a distinctive dorsal patch of short bristles. Apophysis posterior 1.5 times the length of apophysis anterior. Sterigma slightly sclerotized and prominent, lamella antevaginalis sclerotized, projected posteriorly, with two elongated lobes distally, with rounded tips, lamella postvaginalis mostly membranous, very slightly sclerotized in the central portion and slightly striated, ostium bursae with a flattened opening, ductus bursae sclerotized, elongated, flattened dorso-ventrally and sinuated, corpus bursae thin, elongate-shaped, longitudinally striated, basal portion slightly thinner and arising to the right. Accessory bursae bigger than corpus bursae, rounded-shaped and slightly striated.

Etymology. – *Pseudohemihyalea montywoodi* **sp**. **n**. is named in honor of Dr. Monty Wood in recognition of his long and successful career studying the Tachinidae (Diptera) of Costa Rica and in gratitude for all the support received from him as a scientist advisor to the old INBio staff.

Remarks. – This species is scarcely represented in the MNCR collection. The studied series was successfully DNA barcoded and even though this species shares the same genetic sequence (BIN BOLD:ACE8749) with five other species in a very complex genetic group, all specimen sequences of this species align perfectly together in a single section of the DNA barcoding tree. This made possible the sexual association of males and females.

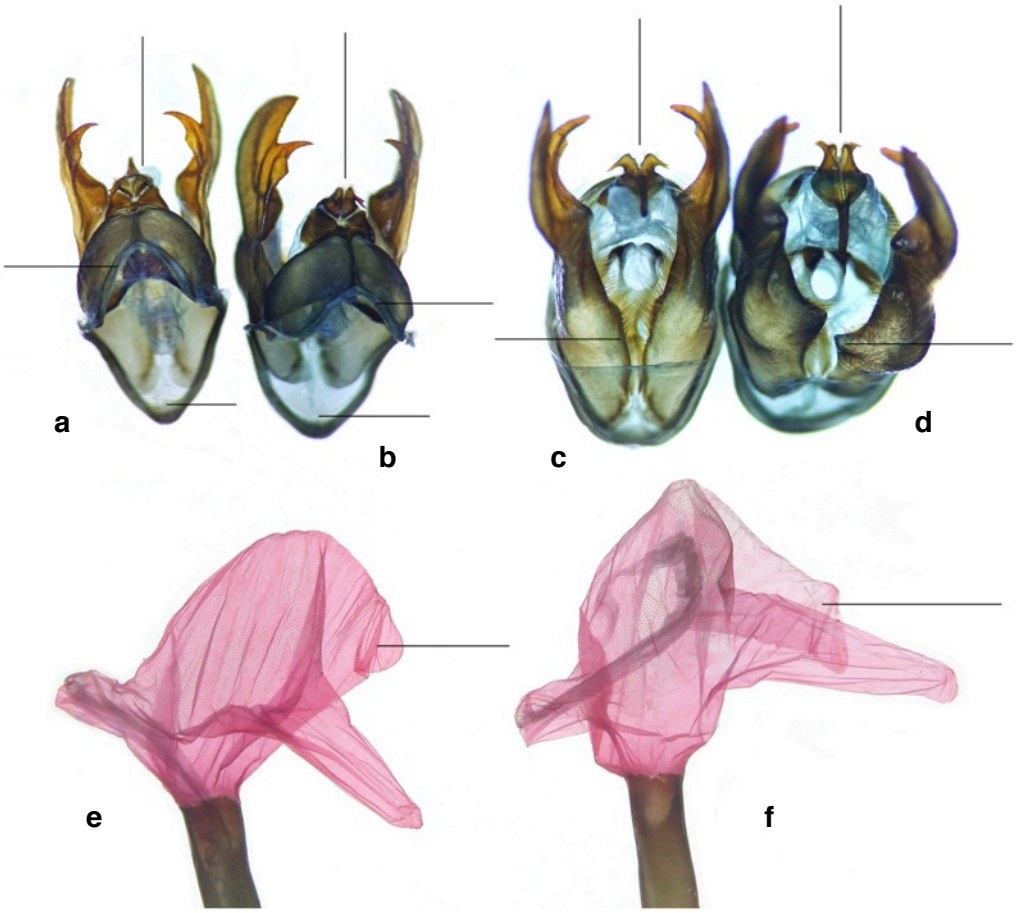

Figure 15. Comparative plate of the male genitalia of *P. ochracea* and *P. annario*.

P. ochracea. **a**. dorsal view of genitalia capsule. **c**. ventral view of genitalia capsule. **f**. detail of vesica.
P. annario. **b**. dorsal view of genitalia capsule. **d**. ventral view of genitalia capsule. **e**. detail of vesica.

XVIII. ***Pseudohemihyalea eugeniephillipsae*** Espinoza **sp**. **n**.
BIN BOLD: Not sequenced
(Fig. 8a-d, 13i-l, 14o)
ZooBank: https://zoobank.org/52A8C657-2517-4917-909E-9B22022B35C2

Material examined. – **6** ♂, **11** ♀.

Holotype, ♂, INB0003430883. COSTA RICA, Prov. Alajuela, Volcan Poas Nat. Pk. 2350 m, 19 Dec 1981, Col. DH Janzen & W. Hallwachs, Tp. de Luz, 10.1197472, -84.2363583.

Paratypes

COSTA RICA

- **2** ♂, INBIOCRI000195453, INBIOCRI000276488. Prov. Heredia, Est. Barva, Braulio Carrillo N. P. 2500 m, Apr. 1990, Col. A. Fernandez, 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI000183104. Prov. Heredia, Cerro Chompipe, Res. Biol. Chompipe, Col. J. Corrales, J. Ugalde & E. Phillips, 18 May1990, 10.0884400, -84.0778811;
- **1** ♂, INBIOCRI000089156. Prov. Heredia, Estac. Barva, Braulio Carrillo N. P., 2500 m, 01-30 Nov. 1989, Col. G. Rivera, 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI000225873 (Dissected). Prov. Heredia, Est. Barva, P. N. Braulio Carrillo, 2500 m, 01-30 Jun 1990, Col. B. Apu & G. Varela, 10.1331750, -84.1211306;
- **3** ♀, INBIOCRI000225872, INBIOCRI000225858, INBIOCRI000225857. Prov. Heredia, Est. Barva, P.N. Braulio Carrillo, 2500 m, 01-30 Jun 1990, Col. B. Apu & G. Varela, 10.1331750, -84.1211306;
- **1** ♀, INBIOCRI000664545. Prov. Heredia, Est. Barva, Braulio Carrillo N. P., 2500 m, Oct. 1989, Col. G. Rivera, 10.1331750, -84.1211306;
- **1** ♀, INB0003429648 (Dissected). Prov. Alajuela, Volcan Poás Nat. Pk. 2350 m, 15 Dec 1982, Col. DH Janzen & W. Hallwachs, 10.1197472, -84.2363583;
- **1** ♀, INBIOCRI000001661. Prov. Heredia, Est. Barva, Braulio Carrillo N. P., 2500 m, April 1989, Col. Manuel Zumbado & A. Fernandez, 10.1331750, -84.1211306;
- **1** ♀, INBIOCRI000157189. Prov. Heredia, Estac. Barva, Braulio Carrillo N. P., 2500 m, 01-28 Feb. 1990, Col. G. Rivera, 10.1331750, -84.1211306;
- **2** ♀, INB0003641740, INB0003641739. (Projet ALAS). Prov. Heredia, N.P. Braulio Carrillo rainforest, Volcán Barva area, Blacklight 30W, Vb (12), III 20.30-21.30h, 2730 m, 28.IV.2003, Gunnar Brehm leg., 10.1383333, -84.1;
- **1** ♀, INB0003218803. (Projet ALAS). Prov. Heredia, 6km ENE Vara Blanca, 1950-2050 m, 16 Feb 2002, INBio-OET-ALAS Transect, 20/L/02/014, 10.1761111, -84.1113889;
- **1** ♀, MNCR-A05143162. Cartago, El Guarco, San Isidro, Estación La Esperanza, 2600 m, 24 May 2002, B. Espinoza, 9.6839214, -83.8766878, #000059659. (Deposited MNCR).

Diagnosis. – This species can be recognized by its olive-brown background color combined with a postmedial and subterminal series of lighter spots on forewing, as well as by the basal portion of uncus, formed by an open and concave structure, with a membranous interior surface, which projects dorsally into two elongated processes, that are very slightly bent laterally at the tip. *Pseudohemihyalea eugeniephillipsae* **sp**. **n**. shares similar background color patterns with of *P. carteronae*, but *P. eugeniephillipsae* **sp**. **n**. is slightly larger and the females have less defined and less marked series of patches on the forewing.

Description

Adult male (Fig. 8a, b). INB0003430883.

Forewing length 26.37-27.59 mm (n = 06). Head, thorax and abdomen olive brown. Palpus moderately long, with dark brown laterally, antenna bipectinate, almost ¾ the length of forewing length, legs olive brown with dark brown distally on femora, tarsal segments dark brown, abdomen dorsally hairy on the basal half (tergites 1-5). Forewing olive brown, postmedial and subterminal series of lighter spots, a lighter elongated patch basally on inner margin. Hindwing semihyaline, pale yellowish-cream.

Male genitalia (Fig. 13i-l). INBIOCRI000225873.

Uncus elongated, thin in dorsal view on the distal half, with few short setae dispersed laterally, basal half broad, consisting of a concave and open structure, with a membranous interior surface that is projected dorsally, with two elongated processes, pointed-shaped, very slightly bent laterally at the tip. Tegumen slightly bulky, with anterior margin concave. Valva broad basally and distally, costal margin straight, shorter than ventral margin, with a pointed tip, ventral margin lobulate on the basal portion, slightly constricted in the middle, distally with a pointed and curved inward tip. Transtilla strongly sclerotized, projected posteriorly over the anellus, with the distal portion spinulate. Juxta elongated, sclerotized, very slightly convex, slightly constricted near the upper portion. Saccus broad and expanded anteriorly. Aedeagus thin, elongated, coecum penis slightly bulky, vesica moderately short, with two elongated lobes, one arising dorsally and curved to the left and the second one laterally, arising to the right.

Adult female (Fig. 8c, d). INBIOCRI000225857.

Forewing length 28.05-29.05 mm (n = 10). Similar to male, but bigger and more robust, the background color of forewing slightly lighter in the female.

Female genitalia (Fig. 14o). INB0003429648.

Papilla analis rectangular-shaped, a distinctive patch of short bristles dorsally near the base, pseudopapilla large, well developed. Apophysis posterior the same size as apophysis anterior. Sterigma prominent, partially membranous, lamella antevaginalis, sclerotized, projecting posteriorly, with a bilobulate distal portion, with rounded tips, lamella postvaginalis mostly membranous, striated and irregularly sclerotized in the central portion, ostium bursae sclerotized, ductus bursae elongated, flattened dorso-ventrally, sclerotized, sinuated, corpus bursae lobulated, with the basal half thinner and slightly striated on dorsal surface, accessory bursae rounded, more or less the same size as corpus bursae.

Etymology. – *Pseudohemihyalea eugeniephillipsae* **sp**. **n**. is named after Dr. Eugenie Phillips Rodríguez in recognition of her long career studying the Micro-Lepidoptera of Costa Rica.

Remarks. – This species was identified in Costa Rica as *P. celsicola* by Hervé de Toulgoët himself, in 1995. However, based on Toulgoët's original description of *P. celsicola* published in 1982, we concluded that his determination was incorrect. Indeed, *P. eugeniephillipsae* **sp**. **n**. shares some phenotype characteristics with *P. celsicola* which likely explain the misidentified; however, these two taxa are morphologically distinct. Their male genitalia structures differ significantly, particularly in the shape of the uncus (see description above). Consequently, specimens of *P. celsicola* remained unrecognized in the MNCR collection until now.

XIX. ***Pseudohemihyalea marcepsteini*** Espinoza **sp**. **n**.

BIN BOLD: No sequenced

(Fig. 8e, f, 13m-p)

ZooBank: https://zoobank.org/080FC915-0C14-4F4D-A7F4-DE58CA91311B

Material examined. – **3** ♂.

Holotype, ♂, INB0003430882. COSTA RICA, Prov. Alajuela, Volcán Poás, 2350 m, 19 Dec 1981. D.H. Janzen & W. Hallwachs. 10.1197472, -84.2363583.

Paratypes

COSTA RICA

- **1** ♂, INB0003640388. Prov. Heredia, N.P. Braulio Carrillo rainforest, Volcan Barva area, Blacklight 30W, Vb (12), | 18.30-19.30h, 2730 m, 28.IV.2003, Gunnar Brehm leg. 10.1383333, -84.1;
- **1** ♂, INB0003217612 (Dissected). Prov. Heredia, 6 km ENE Vara Blanca, INBio-OET-ALAS transect, 20/L/02/002, 1950-2050 m, 10 Feb 2002, D. Wagner, A. Kawahara, J. Rota, 10.1761111, -84.1113889. (Deposited MNCR).

Diagnosis. – This species can be distinguished by the diffuse discocellular small black spot on FW, and its background color combination of olive brown slightly speckled with dark brown scales, and its semihyaline medial area. It can be also recognized by the male genitalia in ventral view, where the inner surface of the valva in the basal half is square-shaped. In color patterns, this species is similar to *P. bosullivani* **sp**. **n**., but in the male genitalia they differ significantly for each other in the shape of valva in ventral view, which is square-shaped in *P. marcepsteini* **sp**. **n**., while straight in *P. sullivani*.

Description

Adult male (Fig. 8e, f). INB0003430882.

Forewing length 26.72-27.45 mm (n = 03). Head, thorax and abdomen olive brown. Palpus moderately long, with the last segment very small and thin, antenna bipectinate, light brown, less than ¾ the length of forewing length, legs olive brown. Forewing olive brown, slightly speckled with dark brown scales, area of the discal cell, beyond it and below it until the anal vein semihyaline, with a diffuse discocellular small black spot. Hindwing semihyaline, with some olive brown on apex and outer margin, inner margin and anal angle with bright yellowish long scales.

Male genitalia (Fig. 13m-p). INB0003217612.

Uncus elongated, thin in dorsal view on the distal half, basal half broad, conformed by a concave and open structure, with a membranous interior surface, that projects dorsally with two elongated processes, straight and pointed shape. Tegumen wide, with the anterior margin concave, open "V-shaped". Valva broad, costal margin straight, with a pointed tip, ventral margin with the basal half strongly lobulate, distal half straight, covered by elongated bristles, the tip pointed and curved inward, basal half of valva with inner surface square-shaped in ventral view. Transtilla strongly sclerotized, projected posteriorly over the anellus, lateral portions spinulate, distal portion covered by thick and short spines. Juxta slightly sclerotized, slightly convex, slightly broader in the lower half than in the upper half. Saccus expanded anteriorly, open V-shaped. Aedeagus elongated, coecum penis slightly bulky, vesica moderately short, rounded-shape basally, with two elongated lobes, one postero-dorsal, with a pointed tip, arising to the left and the second one postero-lateral, arising to the right.

Female. – Unknown.

Etymology. – *Pseudohemihyalea marcepsteini* **sp**. **n**. is dedicated to Dr. Marc Epstein from the CDFA in recognition of his many years of taxonomic contributions on Limacodidae to the national biodiversity inventory of Costa Rica.

Remarks. – This species and *P. eugeniephillipsae* **sp**. **n**., are also similar in the male genitalia, sharing similar structures of uncus, valva and aedeagus. However, differences in the adult phenotype and in the shape of the valva in ventral view, make it easier to distinguish them from each other. Neither of them has been DNA barcoded and it would not be a surprise if, as with other species of *Pseudohemihyalea* studied in Costa Rica, these two taxa share the same BIN.

XX. ***Pseudohemihyalea corralesi*** Toulgoët, 1996

BIN BOLD: Not sequenced

(Fig. 8g, h, 14p)

Pseudohemihyalea corralesi Toulgoët, 1996: 180.

Type locality. – Costa Rica, San José, Zurquí.

Type specimens. – Holotype female (MNCR).

Material examined. – **11** ♀.

COSTA RICA

- **1** ♀, INBIOCRI000532695 (Holotype). Prov. San José, Est. Zurquí, 500m antes del Túnel, 1600 m, Col. G. Maass, Abr. 1991, 10.0575000, -84.0122222, (Deposited MNCR);
- **1** ♀, INBIOCRI000183083. Prov. Heredia, Cerro Chompipe, Res. Biol. Chompipe. 2000 m, 18 May 1990, Col. J. F. Corrales, J. Ugalde & E. Phillips, 10.0884400, -84.0778811;
- **1** ♀, INB0003506985. Prov. Cartago, Río Grande de Orosi, Tapantí, 1400 m, 8-9 Jul 1986, Col. D.H. Janzen & W. Hallwachs, 9.7705556, -83.7752778;
- **2** ♀, INB0003409196, INB0003409195 (Dissected). Prov. San José, Estación Zurquí (el Túnel), Par. Nac. Braulio Carrillo, 1500 m, 01-30 Nov. 1995, Col. I. A. Chacón, 10.0677778, -84.0025000;

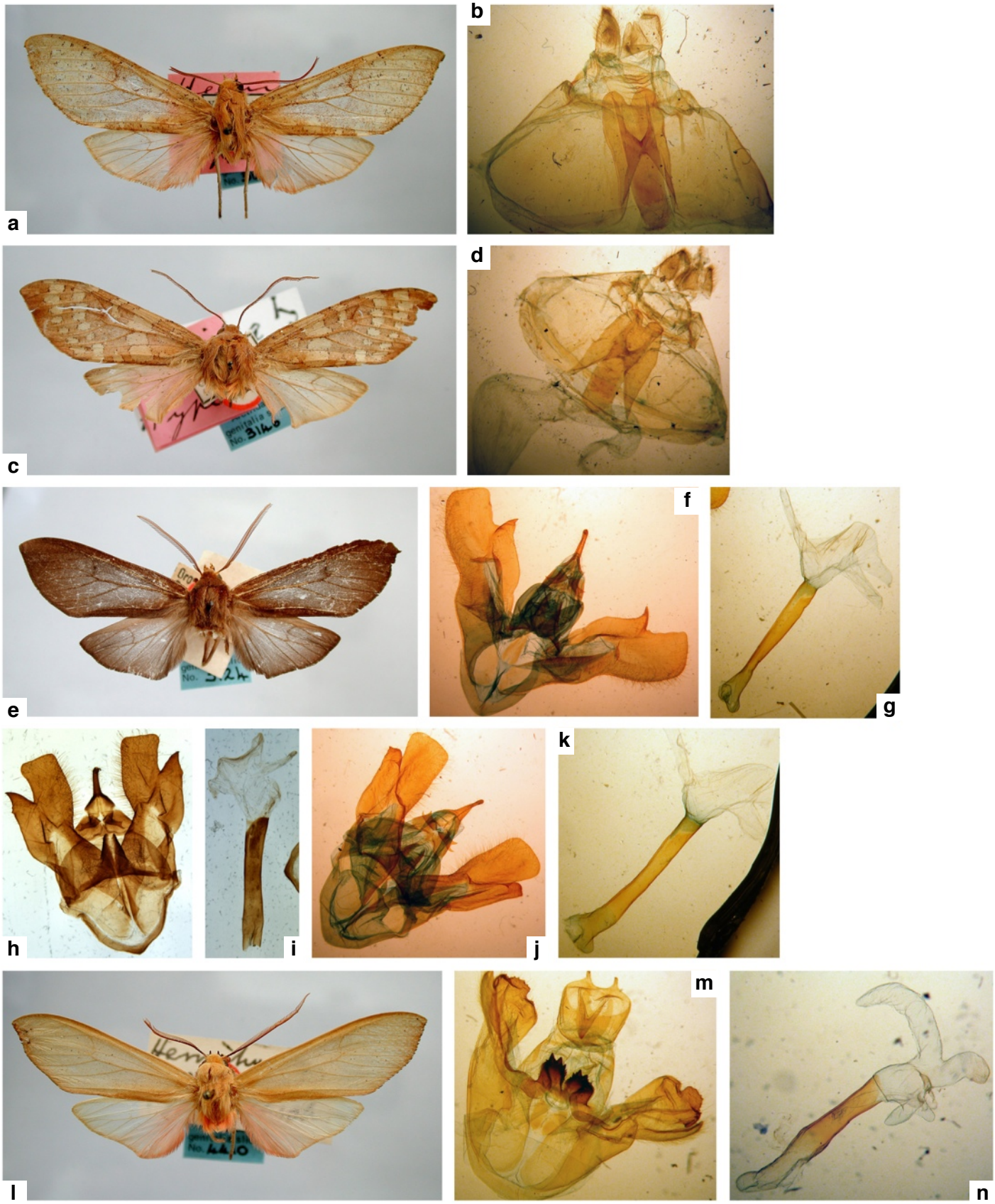

Figure 16. Type and not type images of *Pseudohemihyalea*.

a. *P. ochracea* (Rothschild, 1909), holotype No. 3145, female, dorsal view. **b**. *P. ochracea* holotype female genitalia slide No. 3145, ventral view. **c**. *P. battyi* (Rothschild, 1909), syntype No. 3146, female, dorsal view. **d**. *P. battyi* syntype female genitalia slide No. 3146, ventral view. **e**. *P. niger* (Seitz, 1925), holotype No. 3124, male, dorsal view. **f**. *P. niger* holotype male genitalia slide No. 3124, genitalia capsule, ventral view. **g**. *P. niger*, holotype male genitalia slide 3124, aedeagus, lateral view. **h**. *P. ochracea,* male genitalia No. AS3505A, genitalia capsule, ventral view, from MNHN (not type). **i**. *P. ochracea,* male genitalia No. AS3505B, aedeagus, lateral view, from MNHN (not type). **j**. *P. oligocycla* (Seitz, 1925), male genitalia slide No. 3147, genitalia capsule, ventral view (not type). **k**. *P. oligocycla*, male genitalia slide No. 3147, aedeagus, lateral view (not type). **l**. *P. schausi*, (Rothschild, 1935), syntype No. 4410, male, dorsal view. **m**. *P. schausi*, syntype male genitalia No. 4410, genitalia capsule, ventral view. **n**. *P. schausi*, syntype male genitalia No. 4410, aedeagus, lateral view.

- **1** ♀, INB0003409214. Prov. San José, P. N. Braulio Carrillo, Cascajal, Est. Zurquí (Túnel), 1700 m, 01-30 SET 1985, I. A. Chacón, Manual, 10.0677778, -84.0025000, #58023;
- **1** ♀, INB0004281159. Prov. Cartago, P.N. Tapantí-Macizo de La Muerte, La Esperanza del Guarco, 2600 m, 3 ABR 2011, Col. I. Chacón, C. Arguedas, Tp de Luz. 9.7074333, -83.8593222, #101987;
- **1** ♀, INB0003217686 (Project ALAS). Prov. Heredia, 6km ENE Vara Blanca, INBio-OET-ALAS transect, 20/L/02/002, 1950-2050 m, 09-10 Feb 2002, D. Wagner, A. Kawahara, J. Rota, 10.1761111, -84.1113889;
- **1** ♀, INB0003218814. Prov. Heredia, 6km ENE Vara Blanca, INBio-OET-ALAS transect, 20/L/02/014, 1950-2050 m, 16 Feb 2002, D. Brenes, 10.1761111, -84.1113889;
- **2** ♀, Costa Rica (with no specific locality data). (Deposited MNCR).

Diagnosis. – *P. corralesi* is recognized by the shape of the lamella antevaginalis, which is an elongated, strongly sclerotized and acute structure that projects posteriorly. The female of this species is one of the largest and most robust of all females of *Pseudohemihyalea* present in Costa Rica. In terms of coloration, the female of *P. corralesi* was described by Toulgoët as generally beige; thus, the combination a uniform pale color with its large size makes this species unmistakable among others.

Description

Adult female. (Fig. 8g, h). INB0003409214.

See Toulgoët 1996, for original description. Forewing length 31.00-34.13 mm (n = 09).

Male. – Unknown.

Female genitalia (Fig. 14p). INB0003409195.

Papilla analis rectangular-shaped, covered by a mixture of short and long bristles and a distinctive patch of short bristles dorsally, apophysis posterior longer than apophysis anterior but the anterior one thicker, ostium bursae with the opening flattened, crescent-shaped, sterigma prominent, sclerotized, lamella antevaginalis sclerotized, projecting posteriorly, with an elongated, thin process, horn-shaped, lamella postvaginalis broad, sclerotized, very slightly striated in the medial portion, ductus bursae elongated, sclerotized, flattened dorso-ventrally, sinuated, corpus bursae lobulate, with the basal portion very thinner and striated longitudinally. Accessory bursae about two times the size of corpus bursae.

Remarks. – *P. corralesi* was described based on a single female specimen. Although the species does not appear to be rare, it is not abundant in the country, and collected samples are restricted to the Cordillera Volcanica Central, in the central region of Costa Rica, at elevations from 1300 to 2600 meters. Remarkably, no males have been associated with this species to date. The species has not yet been DNA barcoded; however, given the unique female characteristics and the specific collection, the absence of male specimens remains unexpected. The females of *P. corralesi* are the largest and most robust females of all the *Pseudohemihyalea* species found in Costa Rica and so, probably the males should be also larger if compared with those of other species into the genus.

This species was considered by Toulgoët to be closely related to *P. asignata* (= *P. annario*) (Reich, 1938), species known only from a unique female holotype collected from San José, Costa Rica and that is deposited in Tel Aviv University. Although photographs of the underside of the *P. asignata* holotype were requested, it was not possible to optain them to completely rule out any conspecificity with the species under study. Nevertheless, the available dorsal images sufficient to partially observe the shape of the lamella antevaginalis in *P. asignata*, which appears to be a broad, bilobed structure with rounded tips. This observation is congruent with the Toulgoët partial illustration (Toulgoët, 1994). Then, we agree withToulgoët's observations regarding the distinct female genitalia structures between females of *P. corralesi* and *P. asignata*. On the other hand, although Toulgoët provided no formal description of the female genitalia of *P. corralesi*, he provided a detailed illustration of these structures. Thus, we herein provide additional details on the female genitalia description to better characterize *P. corralesi*. Finally, we emphasize that male specimens remin still unknown for this species.

XXI. ***Pseudohemihyalea fuscescens*** (Rotschild, 1909) **new comb**.

BIN BOLD:AAX7164

(Fig. 9a-d, 13q-t, 14q)

Hemihyalea fuscescens Rothschild, 1909: 277.

Type locality. – Costa Rica.

Type specimens. – Described from 2 female and 1 male syntypes (BMNH).

Material examined. – **28** ♂, **19** ♀.

COSTA RICA

- **1** ♂, 22-BAES-01933 (Sequenced). Cartago, La Amistad Pacífico, R. F. Río Macho, Est. Biol. Villa Mills, El Tanque, Camino a Buena Vista. 2770 m, 31 de Mayo de 2022. Col. B. Espinoza, 9.5505278, -83.6813638888889;
- **1** ♂, INB0004184779 (Sequenced), (Dissected). Prov. Cartago, La Unión, San Rafael, Campo Escuela Istarú, 1750 m, M. Moraga, 01-04 DEC 2008. 9.8905478, -83.9709083;
- **1** ♂, INBIOCRI000213358. Prov. Heredia, Barva, San José de la Montaña, P.N Braulio Carrillo. Estación Volcan Barva, 2500 m, 01-30 APR 1990, A. Fernández, 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI000183084. Prov. Heredia, Cerro Chompipe, Res. Biol. Chompipe, 2000 m, 18 May1990, Col. J. Corrales, J. Ugalde & E. Phillips, 10.0884400, -84.0778811;
- **2** ♂, INBIOCRI000140063, INBIOCRI000089257. Prov. Heredia, Barva, San José de la Montaña, P.N. Braulio Carrillo. Estación Volcan Barva, 2500 m, 01-30 NOV 1989, G. Rivera, 10.1331750, -84.1211306;
- **2** ♂, INBIOCRI000001707, INBIOCRI000001708. Prov. Heredia, Barva, San José de la Montaña, P.N. Braulio Carrillo. Estación Volcan Barva, 2500 m, 01-30 APR 1989, M. A. Zumbado, 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI000671713. Prov. Heredia, Barva, San José de la Montaña, P.N Braulio Carrillo, Estación Volcan Barva, 2500 m, 01-31 OCT 1989, G. Rivera, 10.1331750, -84.1211306;
- **3** ♂, INBIOCRI002200063, INB0003447066 (Dissected), INBIOCRI002200064. Prov. Puntarenas, Coto Brus, Pittier, Estación Pittier, 4.2 Km SW del Cerro Gemelo, 1660 m, 05-18 ENE 1995, R. B. Gamboa, 9.0256639, -82.9626953;
- **1** ♂, INBIOCRI000054163 (Dissected). Prov. Heredia, Barva, San José de la Montaña, P.N Braulio Carrillo. Estación Volcan Barva, 2500 m, 01-31 AGO 1989, G. Rivera, 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI002168869 (Dissected). Prov. Puntarenas, Coto Brus, Pittier, Estación Pittier, 4.2 Km SW del Cerro Gemelo, 1660 m, 05-18 ENE 1995, M. Moraga, 9.0256639, -82.9626953;
- **1** ♂, INBIOCRI000169363. Prov. Heredia, Barva, San José de la Montaña, P.N Braulio Carrillo. Estación Volcan Barva, 2500 m, 01-31 MAR 1990, A. Fernández, 10.1331750, -84.1211306;
- **1** ♂, INBIOCRI002212313. Prov. Puntarenas, Coto Brus, Pittier, Estación Pittier, 4.2 Km SW del Cerro Gemelo, 1660 m, 05-18 ENE 1995, A. Mora, 9.0256639, -82.9626953;
- **1** ♂, INB0004313505 (Dissected). Prov. Cartago, Paraiso, Orosí, Carretera Interamericana, km 92, Finca Los Nímbolos, 3300 m, 24-27 JUL 2007, B. Espinoza & B. Sullivan, 9.5617972, -83.74091944444444;
- **1** ♂, INBIOCRI002200850. Prov. Puntarenas, Coto Brus, Pittier, Estación Pittier, 4.2 Km SW del Cerro Gemelo, 1660 m, 05-18 ENE 1995, E. Fletes, 9.0256639, -82.9626953;
- **1** ♀, INB0003035275 (Sequenced), (Dissected). Prov. Puntarenas, Coto Brus, Pittier, Sendero a Cerro Pittier, 600 m NW de la Estación, 1750 m, 18 ENE 1999, M. Moraga, 9.0288328, -82.9649631;
- **1** ♀, INBIOCRI000458511. Prov. Puntarenas, Coto Brus, Sabalito, Finca Cafrosa, 2 Km NW de Mellizas, 1200 m, 01-31 OCT 1989, M. Ramirez, 8.9041667, -82.7883333;
- **1** ♀, INBIOCRI000697600. Prov. San José, Pérez Zeledón, Páramo, Finca Zacatales, 2300 m, 22 FEB 1992, J. Corrales, 9.5335644, -83.8192244;
- **5** ♀, INBIOCRI000089261, INBIOCRI000089259, INBIOCRI000140039, INBIOCRI000140037, INBIOCRI000089260. Prov. Heredia, Barva, San José de la Montaña, P.N Braulio Carrillo, Estación Volcan Barva, 2500 m, 01-30 NOV 1989, G. Rivera, 10.1331750, -84.1211306;

- **2** ♀, INBIOCRI000142946, INBIOCRI000142959. Prov. Heredia, Barva, San José de la Montaña, P.N. Braulio Carrillo, Estación Volcan Barva, 2500 m, 01-30 NOV 1989, A. Fernández, 10.1331750, -84.1211306;
- **2** ♀, INBIOCRI000671715, INBIOCRI000671716. Prov. Heredia, Barva, San José de la Montaña, P.N Braulio Carrillo, Estación Volcan Barva, 2500 m, 01-31 OCT 1989, G. Rivera, 10.1331750, -84.1211306;
- **1** ♀, INBIOCRI000165209. Prov. Heredia, Barva, San José de la Montaña, P.N. Braulio Carrillo, Estación Volcan Barva, 2500 m, 01-31 MAR 1990, G. Rivera, 10.1331750, -84.1211306;
- **1** ♀, INBIOCRI001080898. Prov. Puntarenas, Coto Brus, Sabalito, Finca Cafrosa, Est. Las Mellizas, P. N. Amistad, 1239 m, 01-30 APR 1989, G. Mora, 8.9034167, -82.7887528;
- **1** ♀, INBIOCRI001080897. Prov. Puntarenas, Coto Brus, Sabalito, Finca Cafrosa, Est. Las Mellizas, P. N. Amistad, 1239 m, 01-30 APR 1989, G. Mora, 8.9034167, -82.7887528;
- **2** ♀, INBIOCRI000213357, INBIOCRI000213356. Prov. Heredia, Barva, San José de la Montaña, P.N. Braulio Carrillo, Estación Volcan Barva, 2500 m, 01-30 APR 1990, A. Fernández, 10.1331750, -84.1211306. (Deposited MNCR).

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- **5** ♂, San José, Cerro de la Muerte, 4-V-2010, 2722 m, M. Laguerre leg., one male is sequenced: sequenced process ID ARCTD706-12, BOLD ID MILA1831 (yellow printed label).
- **1** ♂, San José, Cerro de la Muerte, 14-IX-2009, 2722 m, D. Herbin leg.
- **3** ♂, San José, Paramo Cerro de la Muerte, 4-V-2010, 3209 m, D. Herbin leg., two males are dissected Gen. ML2361 and ML4009, one male is sequenced: sequenced process ID ARCTD548-12, BOLD ID MILA1673 (yellow printed label). (Deposited MLC). NICARAGUA.
- **1** ♂, **1** ♀, Matagalpa, Road Matagalpa-Jinotega, PK 14, 26-VII-2000, 1470 m, M. Laguerre leg., the male is dissected gen. ML2369;
- **1** ♀, Matagalpa, Road Matagalpa-Jinotega, PK 14, 30-VII-2000, 1400 m, M. Laguerre leg. (Deposited MLC).

Diagnosis. – *Pseudohemihyalea fuscescens* **new comb**. can be distinguished by having semihyaline wings and the cilias of FW dark brown all over the outer margin and on the distal portion of the inner margin. This species is very similar to *P. daraba*, but the latter is more translucent, with the dark brown of inner margin notably thicker. Furthermore, *P. daraba* has a yellowish-ochre thorax, whereas it is light brown in *P. fuscescens* and the dark brown spot on the tegula, characteristic of *P. daraba* is absent in *P. fuscescens*.

Description

Adult male (Fig. 9a, b). INBIOCRI000169363.

See Rotschild, 1909, for original description. Forewing length 21.59-24.61 mm (n = 18).

Male genitalia (Fig. 13q-t). INB0004184779.

Uncus very broad basally, expanded laterally and densely covered with long setae, distal half very short, triangular-shaped, with a pointed tip and covered by long bristles ventrally. Tegumen slightly sclerotized, semi-translucent, with the posterior margin concave. Valva broad basally, with the distal half much thinner and formed by two individual elongated processes, one shorter costal process with a rounded tip and a larger ventral process spatulated-shaped at the tip. Costal margin of valva with a small pointed processs arising dorsally on the middle and curved inward. Transtilla and anellus strongly sclerotized, fused, with two lateral elongated processes, curved upward and covered by thick spines. Juxta sclerotized, fused to the anellus, convex, with the lower portion bifurcate. Aedeagus elongated, thin, slightly curved on the posterior part, with the coecum penis expanded ventrally, vesica short, with a short lobe arising dorsally, projecting anteriorly and an elongated lobe arising posteriorly, curved to the right, with a pointed tip.

Adult female (Fig. 9c, d). INBIOCRI000697600.

The female was not described by Rothschild, but there is no sexual dimorphism present in *P. fuscescens*. Forewing length 23.13-25.55 mm (n = 19).

Female genitalia (Fig. 14q). INB0003035275.

Papilla analis rectangular, apophysis posterior very slightly longer than apophysis anterior, ostium bursae very slightly sclerotized, with a flattened opening, surrounding surface very slightly sclerotized, perpendicularly striated, lamella antevaginalis sclerotized, prominent, with the posterior margin slightly concave in the middle and lateral margins rounded, lamella postvaginalis sclerotized, prominent, strongly convex, rounded, strongly striated, hood-shaped. Ductus bursae slightly sclerotized, not very long, flattened dorsoventrally. Corpus bursae elongated, longitudinally striated, basal portion thin, with an elongated extension curved-shaped that connects the accessory bursae distally, distal portion of corpus bursae lobulate.

Remarks. – *P. fuscescens* was considered by Toulgoët an *Amastus* species based on its genitalia structures, which according to him are those of *Amastus*. Indeed, the genitalia structures of *P. fuscescens* are not typical within the genus *Pseudohemihyalea*, at least not for the other species represented in Costa Rica, but morphologically the adults share general patterns that place this species into *Pseudohemihyalea* and this was also verified by DNA sequences.

Conclusion

After an exhaustive revision of the *Pseudohemihyalea* species present in Costa Rica, based on previous identifications made by Hervé de Toulgoët in the mid-1990s, and with extensive comparison with species from other latitudes in the Central American region, the number of the species in the country increased from 10 to 21 taxa. We could define that some of the species previously identified are not found in the country and that they possibly have narrower distribution ranges than those reported in the existing literature, at least for some of them.

The high level of complexity found in *Pseudohemihyalea* is a fact that can be also observed genetically in the group of six species sharing the same sequence, with the BIN BOLD:ACE8749, but clearly separated by patterns of adults and genitalia structures. *P. ochracea* and *P. annario* are probably the most difficult species to separate from each other by adult character, but not impossible if looking at the genitalia. Sexual association is very complex considering morphological similitude between the species found in the country, besides most of the species are sympatric, which makes even more difficult the sexual association by species.

Then, with some exceptions of species phenotypically very distinctive, like *P. anapheoides* or *P. despaignei melanorubra*, DNA barcoding is definitively the best way to identify each taxon.

Nothing on natural history of *Pseudohemihyalea* species represented in Costa Rica has been reported, so we hope that future studies can add valuable information about the life cycles of this group.

Finally, it should be emphasized that this is a partial study, focused only in the Costa Rican species and so, for other regions of Central America like Guatemala and more to the North with Mexico and Southern USA as well as the South America region, many of the *Pseudohemihyalea* species are still unknown and most of them need to be deeply reviewed to clarified their status.

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Authors contribution [1]

Publisher Correspondence. – ES
Writing the article. – ES, LM, JD, HW
Article proofreading. – ES, LM
Descriptions. – ES
Bibliographic work. – SP, LM, JD, HW
Material study. – ES, LM, JD, HW
Author of the figures. – ES, LM

[1] **ES** = Espinoza-Sanabria B.A. – **LM** = Laguerre M. – **JD** = Janzen D.H. – **HW** = Hallwachs W.

Résumé

Espinoza-Sanabria B.A., Laguerre M., Janzen D.H. & Hallwachs W., 2026. – Révision des espèces du genre *Pseudohemihyalea* du Costa Rica (Erebidae Arctiinae Arctiini Phaegopterina) avec la description de nouveaux taxons, ainsi que la redescription et la délimitation des espèces précédemment décrites dans ce genre et présentes dans le pays. *Faunitaxys*, 14(51) : 1 – 37.

Nous révisons les espèces du genre *Pseudohemihyalea* Rego Barros, 1956 signalées au Costa Rica. Cette étude s'appuie sur des recherches menées de longue date sur la sous-famille des Arctiinae (Erebidae) et intègre des données génomiques récentes (codes-barres ADN) pour compléter les analyses morphologiques. Nous délimitons douze espèces de *Pseudohemihyalea* précédemment identifiées au Costa Rica, dont certaines avaient été décrites par Hervé de Toulgoët dans les années 1980 et 1990. Nous redécrivons *P. ochracea*, *P. daraba* et *P. annario*, cette dernière étant rétablie en tant qu'espèce valide après avoir été mise en synonymie avec *P. ochracea*. Nous décrivons également neuf nouvelles espèces : *Pseudohemihyalea donharveyi* **sp**. **n**., *Pseudohemihyalea anaisabelsanabriae* **sp**. **n**., *Pseudohemihyalea johnbrowni* **sp**. **n**., *Pseudohemihyalea toulgoëti* **sp**. **n**., *Pseudohemihyalea rexhamiltoni* **sp**. **n**., *Pseudohemihyalea bosullivani* **sp**. **n**., *Pseudohemihyalea montywoodi* **sp**. **n**., *Pseudohemihyalea eugeniephillipsae* **sp**. **n**., *Pseudohemihyalea marcepsteini* **sp**. **n**., qui étaient passées inaperçues ou avaient été mal identifiées au sein de lots d'autres espèces. Par ailleurs, nous établissons la synonymie entre *Pseudohemihyalea asignata* (Reich, 1938) et *Pseudohemihyalea annario* (Dyar, 1914) et rétablissons *Amastus fuscescens* (Rothschild, 1909) comme une espèce valide du genre *Pseudohemihyalea*, ce qui donne lieu à une nouvelle combinaison. Enfin, nous présentons des illustrations des adultes ainsi que des genitalia mâles et femelles, les données de codes-barres ADN et la répartition géographique au Costa Rica pour toutes les espèces étudiées.

Mots-clés. – Phaegopterina, Arctiinae, *Pseudohemihyalea*, *Amastus*, taxonomie, description, nouvelle espèce, barcode, COI, Amérique centrale, Costa Rica.

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Révision des espèces du genre *Pseudohemihyalea* du Costa Rica (Erebidae Arctiinae Arctiini Phaegopterina) avec la description de nouveaux taxons, ainsi que la redescription et la délimitation des espèces précédemment décrites dans ce genre et présentes dans le pays.

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Revision of the *Pseudohemihyalea'* species from Costa Rica (Erebidae Arctiinae Arctiini Phaegopterina) with description of new taxa, as well as redescription and delimitation of species previously described in the genus and present in the country.

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Illustration de la couverture :

Pseudohemihyalea genus. From forest to the lap. Description: Left:Oak forest in the locality of Villa Mills, Cartago Province, Costa Rica. Right: *Pseudohemihyalea* general view of the collection, MNCR.

Crédits:

Bernardo A. Espinoza-Sanabria : Fig. 1-15 & couverture.
Michel Laguerre : Fig. 16.

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